T.Y. B.Sc. (Semester – III) Examination, 2009
MATHEMATICS (Paper – I)
MT – 331 : Metric Spaces
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

> ***N.B.*** : *i)* ***All*** *questions are* ***compulsory.***
> *ii) Figures to the* ***right*** *indicate* ***full*** *marks.*

1. Attempt **each** of the following : **10**

   i) Give an example of a bounded subset of R' which is countable and whose l.u.b., g.l.b. lies in $R' - A$.

   ii) Let $A = [-1, 5]$ be metric space with metric $\rho(x, y) = |x - y|$. Find B [0; 2] in metric space (A, ρ).

   iii) Is the set $A = \{(x, y)/x + y = 1\}$ open in the metric space (R^2, ρ) ? Justify.

   iv) If E is nowhere dense in R', show that any subset of E is nowhere dense in R'.

   v) Give an example of an uncountable proper subset of R^2 which is dense in R^2.

   vi) If $T:[0,\frac{1}{3}] \to [0,\frac{1}{3}]$ is defined as $T(x) = x^3$, then show that T is a contraction on $[0, \frac{1}{3}]$.

   vii) If $f : [0, 1] \to R'$ is defined as $f(x) = x^2 + 5 \sin x + e^x$, then show that f is uniformly continuous on [0, 1].

   viii) Give an example of a compact subset of R' that is not connected.

   ix) Show that the interval (0, 1) with absolute value metric is not a complete metric space.

   x) If $A = \left\{\frac{1}{n} / n \in N\right\}$ then find $\overline{A}$ in R'.

P.T.O.

2. Attempt **any two** of the following : **10**

   i) Prove that the set of all rational numbers, Q is countable.

   ii) Let (M, ρ) be a metric space. If $\{S_n\}_{n=1}^{\infty}$ is a Cauchy sequence of points of M, then prove that sequence $\{\rho(s_1, s_n)\}_{n=1}^{\infty}$ is bounded in R′.

   iii) Let (M_1, ρ_1) and (M_2, ρ_2) be metric spaces. Let $f : M_1 \to M_2$ be continuous function, then prove that $f^{-1}(G)$ is open in M_1 whenever G is open in M_2.

3. Attempt **any two** of the following : **10**

   i) If F_1, F_2 are closed subsets of the metric space M, then prove that $F_1 \cup F_2$ is also closed in M.

   ii) If A and B are sets of first category, then prove that $A \cup B$ is also of first category.

   iii) Prove that metric spaces (0, ∞) and (0, 1) with the absolute value metric are homeomorphic.

4. Attempt **any one** of the following : **10**

   i) a) Let $f : M_1 \to M_2$ be a continuous function and M_1 be a connected metric space, then prove that the range of f is also connected.

   b) Prove that every closed subset of a complete metric space is complete.

   ii) a) If the metric space M has the Heine-Borel property, then prove that M is compact.

   b) Prove that any totally bounded subset of $\mathbb{R}_d$ is finite.

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T.Y.B.Sc. (Semester – III) Examination, 2009
MATHEMATICS (Paper – II)
MT – 332 : Real Analysis – I
(2004 Pattern)

Time: 2 Hours   Max. Marks: 40

N.B. : 1) **All** questions are **compulsory**.
            2) *Figures to the **right** indicate **full** marks.*

1. Attempt **each** of the following :   **10**

   i) If $S = \{S_n\}_{n=1}^{\infty} = \{2n-1\}_{n=1}^{\infty}$ and $N = \{n_k\}_{k=1}^{\infty} = \{k^2\}_{k=1}^{\infty}$ then find S_{n_3}.

   ii) If $\{|S_n|\}_{n=1}^{\infty}$ converges to 0, then prove that $\{S_n\}_{n=1}^{\infty}$ also converges to 0.

   iii) Give an example of sequences $\{s_n\}_{n=1}^{\infty}$ and $\{t_n\}_{n=1}^{\infty}$ to show that

   $$\lim_{n \to \infty} \sup(s_n + t_n) \neq \lim_{n \to \infty} \sup s_n + \lim_{n \to \infty} \sup t_n .$$

   iv) If $S_n = \dfrac{10^n}{n!}$ then find $N \in I$ such that $S_{n+1} < S_n$ $(n \geq N)$.

   v) Prove that the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$ is convergent.

   vi) State the test for convergence of alternating series.

   vii) Show that the series $\displaystyle\sum_{n=1}^{\infty} \frac{n}{2n-1}$ is divergent.

   viii) If $f \in R[a,b]$ then prove that $\left|\displaystyle\int_a^b f\right| \leq \displaystyle\int_a^b |f|$

P.T.O.

ix) Let f be a function on [0, 1] defined by

f(x) = 1; x is rational

= –1; x is irrational

Is f Riemann integrable on [0, 1] ? Justify.

x) Let f(x) = x (0≤x≤1). Let $\sigma = \left\{0, \dfrac{1}{4}, \dfrac{2}{4}, \dfrac{3}{4}, 1\right\}$ be a partition of [0, 1] compute

U[f, σ]

2. Attempt **any two** of the following :   **10**

   i) If $\{S_n\}_{n=1}^{\infty}$ is a convergent sequence of real numbers then prove that

   $$\lim_{n\to\infty} \inf S_n = \lim_{n\to\infty} S_n.$$

   ii) For $n \in I$, let $S_n = \dfrac{1.3.5...(2n-1)}{2.4.6...(2n)}$. Prove that $\{S_n\}_{n=1}^{\infty}$ is convergent and

   $$\lim_{n\to\infty} S_n \leq \dfrac{1}{2}.$$

   iii) Prove that the sequence $\left\{\left(1+\dfrac{1}{n}\right)^n\right\}_{n=1}^{\infty}$ is convergent.

3. Attempt **any two** of the following :   **10**

   i) If $\lim_{n\to\infty} \sup \sqrt[n]{|a_n|} = A$ then prove that the series of real numbers $\sum_{n=1}^{\infty} a_n$ converges

   absolutely if A< 1.

   ii) Test the convergence of $\sum_{n=1}^{\infty} \dfrac{n^n}{n!}$.

   iii) State Cauchy condensation test for convergence of series and use it to test the

   convergence of $\sum_{n=1}^{\infty} \dfrac{1}{n^x}$.

4. Attempt **any one** of the following : 10

    i) a) Prove that a bounded function f defined on a closed and bounded interval [a, b] is Riemann integrable if and only if for given $\in > 0$ there is a subdivision σ of [a, b] such that $U[f,\sigma] - L[f,\sigma] < \in$.

      b) Prove that $\dfrac{\pi^3}{18} \leq \int\limits_{0}^{\pi} \dfrac{x^2}{5+\cos x} dx \leq \dfrac{\pi^3}{12}$

    ii) a) If f is a continuous function on a closed and bounded interval [a, b] and if $\phi'(x) = f(x) \ (a \leq x \leq b)$ then prove that

$$\int\limits_{a}^{b} f(x)dx = \phi(b) - \phi(a)$$

      b) Evaluate the following limit :

$$\lim_{n\to\infty} \left[\frac{1}{n+1} + \frac{1}{n+2} + ... + \frac{1}{n+n} \right].$$

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T.Y. B.Sc. (Semester – III) Examination, 2009
MATHEMATICS (Paper – III)
(MT : 333 – Problem Course Based on MT 331 and MT 332)
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

*N.B. : i) **All** questions are **compulsory**.*
*ii) Figures to the **right** indicate **full** marks.*
*iii) Answers to the **two** Sections should be written in **separate** answer sheets.*

SECTION – I
(Metric Space)

1. Attempt **each** of the following :   **5**

   i) Let $A = \{1,2,3, \ldots n\}$ and B $\{a, b\}$. How many functions are defined from A to B ?

   ii) Give an example of a metric space M and a nonempty proper subset A with the property that every open subset of A is also an open subset of M.

   iii) True or false ? If A and C are connected subsets of the metric space M and if $A \subset B \subset C$, then B is connected. Justify.

   iv) Give an example of a metric space M such that every nonempty subset of M is totally bounded.

   v) Show that a connected subset of R_d is compact.

2. Attempt **any two** of the following :   **10**

   i) Prove that if A is an infinite set and $x \in A$ then A and $A - \{x\}$ are equivalent.

   ii) Let $R^n = \{x = (x_1, x_2, \ldots x_n) / x_i \in R, n \in N \text{ is fixed}\}$. For $x = (x_1, x_2, \ldots x_n)$ and

   $y = (y_1, y_2, \ldots y_n) \in R^n$ let $\sigma(x, y) = \sum_{i=1}^{n} |x_i - y_i|$. Show that (R^n, σ) is metric space.

   iii) For $P = (x_1, x_2), Q = (y_1, y_2) \in R^2$, let

   $\rho(P, Q) = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2}$ be a metric for R^2. Show that (R^2, ρ) is a complete metric space.

                                                                                    P.T.O.

3. Attempt **any one** of the following : **5**

 i) Let $f : R^1 \to R^1$ be defined as $f(x) = \sin x$. Show that f is uniformly continuous function on R^1.

 ii) Prove that a subset A of R^2 is compact if and only if A is closed and bounded.

SECTION – II
(Real Analysis – I)

1. Attempt **each** of the following : **5**

 i) Find the limit superior of the following sequence.

 1, 2, 3, 1, 2, 3, 1, 2, 3.....

 ii) State true or false with justification.

 The sequence $\left\{\dfrac{1}{\sqrt{n}}\right\}_{n=1}^{\infty}$ is in l^2.

 iii) Show that following series is absolutely convergent.

 $$1 - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} + \frac{1}{4!} - .....$$

 iv) Discuss the convergence of series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{10^{10}} \frac{n+1}{n+2}$.

 v) If f is defined on [0, 1] such that

 $$f(x) = \begin{cases} 1; & x \neq \frac{1}{2} \\ 0; & x = \frac{1}{2} \end{cases}$$

 then show that $f \in R[0, 1]$.

2. Attempt **any two** of the following : **10**

 i) Using definition show that the sequence $\{S_n\}_{n=1}^{\infty}$ where $S_n = \dfrac{1}{n}$ is a Cauchy sequence.

ii) Test the convergence of the series $\sum\limits_{n=1}^{\infty} \dfrac{(n+1)x^n}{n^3}$; $x > 0$.

iii) Test the convergence of the series $\sum\limits_{n=3}^{\infty} \dfrac{1}{(\log n)^n}$.

3. Attempt **any one** of the following : **5**

i) Prove that $\displaystyle\int_{0}^{\pi/2} \dfrac{x}{\sin x + 2\cos x} \geq \dfrac{\pi^2}{8\sqrt{5}}$.

ii) If $f(x) = x^2$ and for each $n \in I$,

$\sigma_n = \left\{ 0, \dfrac{1}{n}, \dfrac{2}{n}, \ldots, \dfrac{n}{n} \right\}$ is a partition of [0, 1] then compute

$\displaystyle\lim_{n\to\infty} U[f, \sigma_n]$ and $\displaystyle\lim_{n\to\infty} L[f, \sigma_n]$.

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T.Y. B.Sc. (Semester – III) Examination, 2009
MATHEMATICS (Paper – IV)
MT – 334 : Group Theory (2004 Pattern)

Time : 2 Hours   Max. Marks : 40

***Instructions : 1) All** questions are **compulsory**.*
                    *2) Figures to the **right** indicate **full** marks.*

1. Attempt **each** of the following :   **10**

   i) Show that every group G with identity e and such that $x * x = e, \forall x \in G$ is abelian.

   ii) Is $\langle \mathbb{Q}^\dagger, \cdot \rangle$ a subgroup of $\langle \mathbb{R}, + \rangle$? Justify.

   iii) Find the order of the cyclic subgroup of $\mathbb{Z}_{30}$ generated by 25.

   iv) List all normal subgroups of the group $\mathbb{Z}_5$.

   v) Is the following statement true or false ? Justify.

   'If G is any group of order 6 and H is a normal subgroup of G of order 2, then G/H is abelian.'

   vi) Let $\phi : \langle \mathbb{R}, + \rangle \rightarrow \langle \mathbb{C}^*, \cdot \rangle$ be a homomorphism defined by $\phi(x) = \text{Cos}\,x + i\,\sin x$. Determine $\ker \phi$.

   vii) Give an example of a group of order 4 which is not cyclic.

   viii) Find two elements x, y in the group S_3 such that $(x\,y)^2 \neq x^2 y^2$.

   ix) Show that $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 2x + 5$ is a permutation of $\mathbb{R}$.

   x) Are the groups S_3 and $\mathbb{Z}_6$ isomorphic ? Justify.

P.T.O.

2. Attempt **any two** of the following : **10**

   i) Show that a non-empty subset H of a group G is a subgroup of G if $ab^{-1} \in H, \forall a, b \in H$.

   ii) Let G be a group. Show that the relation $a \sim b$ iff $a = g^{-1} bg$ for some $g \in G$ is an equivalence relation on G.

   iii) Prove that intersection of two normal subgroups of a group G is a normal subgroup of G.

3. Attempt **any two** of the following : **10**

   i) Let $\phi : G \rightarrow G'$ be a homomorphism of a group G into a group G'. Prove that ϕ is one-to-one iff $\ker \phi = \{e\}$.

   ii) Let $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 3 & 6 & 4 & 1 & 8 & 2 & 5 & 7 \end{pmatrix}$ be a permutation in S_8. Express σ^{-1} as a product of disjoint cycles and determine whether σ^{-1} is odd or even.

   iii) Show that if H and K are normal subgroups of a group G such that $H \cap K = \{e\}$, then $hk = kh, \forall h \in H, k \in K$.

4. Attempt **any one** of the following : **10**

   i) Prove that every subgroup of a cyclic group is cyclic. Use this result to find all possible subgroups of $\mathbb{Z}$.

   ii) Let ϕ be a homomorphism of a group G into a group G'. Prove that
   a) If e is the identity in G, then $\phi(e)$ is the identity in G'.
   b) $\phi(a^{-1}) = [\phi(a)]^{-1}, \forall a \in G$.
   c) If H is a subgroup of G, then $\phi(H)$ is a subgroup of G'.
   d) If K' is a normal subgroup of $\phi(G)$ then $\phi^{-1}(K')$ is a normal subgroup of G.

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T.Y. B.Sc. (Semester – III) Examination, 2009
MATHEMATICS (Paper – V)
MT – 335 : Dynamics
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.
        2) *Figures to the right indicate full marks.*

1. Attempt **each** of the following :   **10**

   i) A ball is thrown vertically upwards with a velocity of 30 m/sec. With what velocity will it come back to the ground ?

   ii) Let a particle start with velocity 4 m/sec and move under a constant acceleration of 2 m/sec^2 along a straight line. Find the distance travelled during the 4th second.

   iii) A particle moves along a curve $\bar{r}(t) = b\cos pt\,\hat{i} + c\sin pt\,\hat{j}$. Show that its acceleration is directed towards the origin.

   iv) A body with a mass of 2.5 kg is accelerated at 4 m/sec^2. Determine the force acting on the body.

   v) If a particle is projected from the origin, state the least velocity of projection so as to hit the given point (h, k).

   vi) A force $5\hat{i} + 10\hat{j} - 7\hat{k}$ acts on a particle and displaces it through a displacement $4\hat{i} - \hat{j} - \hat{k}$. Find the work done.

   vii) Define an apse.

   viii) State Kepler's second law of planetary motion.

   ix) A particle executes S.H.M. with amplitude 5 cm. If the velocity of the particle is 8 cm/sec when the particle is at 3 cm from the mean position, find its time period.

   x) State Newton's second law of motion.

2. Attempt **any two** of the following : **10**

   i) Obtain radial and transverse components of velocity and acceleration of a moving particle.

   ii) A steamer takes time t_1 to travel a distance 'a' up the river and time t_2 to return.

   Prove that the speed of the steamer in still water is $\dfrac{a(t_1 + t_2)}{2t_1 t_2}$.

   iii) A vertical height is divided into three equal parts and a particle is let fall from the topmost point. Prove that the times taken to describe the three parts are in the ratio

   $1 : \sqrt{2} - 1 : \sqrt{3} - \sqrt{2}$.

3. Attempt **any two** of the following : **10**

   i) Let m_1 and m_2 ($m_2 < m_1$) be the masses of two particles attached to the two ends of a string which passes over a fixed smooth pulley. If the system is free to move, determine the acceleration, tension in the string and pressure on the pulley.

   ii) A motor car weighing 10 quintals and travelling at 12 m/sec is brought to rest in 18 meters, by the application of its brakes. Find the work done by the force of resistance due to brakes.

   iii) Show that for a given velocity of projection, the maximum range down a plane of inclination α is greater than that up the plane in the ratio
   $(1 + \sin\alpha) : (1 - \sin\alpha)$.

4. Attempt **any one** of the following : **10**

   i) a) Suppose a particle is moving under a central attractive force of F per unit mass. Show that the differential equation of the orbit, in reciprocal polar form, is

$$\frac{d^2u}{d\theta^2} + u = \frac{F}{h^2 u^2}.$$

     b) At the ends of three successive seconds, the distances of a point moving with S.H.M., from its mean position are 1, 5 and 5. Show that the period of a complete oscillation is $\dfrac{2\pi}{\theta}$, where $\cos \theta = \dfrac{3}{5}$.

   ii) a) The pedal equation of an ellipse referrred to focus as pole is

$$\frac{b^2}{p^2} = \frac{2a}{r} - 1.$$ Find the law of force.

     b) Suppose a particle is projected from origin and α is the angle of projection. If R is the horizontal range of a projective then prove that the equation of the trajectory of the projectile may be put in the form

$$y = x \tan \alpha \left(1 - \frac{x}{R} \right).$$

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T.Y. B.Sc. (Semester – III) Examination, 2009
MATHEMATICS (Paper – VI)
MT – 336 : Problem Course (Based on MT 334 and MT 335)
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
2) Figures to the **right** indicate **full** marks.
3) Answers to the **two** Sections should be written in **separate** answer books.

SECTION – I
(Group Theory)

1. Attempt **each** of the following :   **5**

   i) On $\mathbb{Z}^+$, define a binary operation * by $a * b = a^b$. Is * associative ? Justify!

   ii) Let $\phi : \langle \mathbb{R}, + \rangle \rightarrow \langle \mathbb{Z}, + \rangle$ be a function defined by $\phi(x) =$ greatest integer less than or equal to x. Is ϕ a homomorphism ? Justify.

   iii) Is the following statement true or false ? Justify.

   'The odd permutations in S_8 form a subgroup of S_8'.

   iv) List all left cosets of the subgroup H = {0, 3} of $\mathbb{Z}_6$.

   v) Let H be a normal subgroup of a finite group G and let m = (G : H). Show that $a^m \in H, \forall a \in G$.

2. Attempt **any two** of the following :   **10**

   i) If G is a group of even order prove that there is an element of order 2 in G.

   ii) Let G be a group and 'a' be a fixed element of G. Prove that $H_a = \{x \in G / xa = ax\}$ is a subgroup of G.

   iii) Let G be an abelian group and G' be a group isomorphic to G. Prove that G' is also abelian.

3. Attempt **any one** of the following : **5**

   i) Show that A_n is a normal subgroup of S_n, $\forall\, n \in \mathbb{N}$.

   ii) Let H be a subgroup of a group G. Prove that the relation aRb iff $a^{-1}\, b \in H$ is an equivalence relation on G.

SECTION – II
(Dynamics)

1. Attempt **each** of the following : **5**

   i) A body of mass 25 gm is acted on by a constant force. It acquires velocity of 2 cm/sec. in 5 seconds from rest. How large is the force acting ?

   ii) If the radial and transverse velocities are proportional to each other, show that the path is an equiangular spiral.

   iii) If the particle is projected up the smooth inclined plane having inclination 30° with initial velocity of 4.9 m/sec, determine when will it come to rest for an instant.

   iv) If the maximum horizontal range of a particle is R, show that the greatest height attained is $\dfrac{1}{4}$R.

   v) A particle describes a circle, with uniform speed v. Show that a constant force directed to the centre is a possible law of force.

2. Attempt **any two** of the following : **10**

   i) To a man walking at the rate 4km/hr, rain appears to fall vertically. If the actual velocity of rain is 8 km/hr, find its actual direction.

   ii) The sum of two masses of an Atwood's machine is 16 kg. The heavier mass descends 24.5 meters in 4 seconds. What is each mass ?

   iii) Suppose the pedal equation of a central orbit is known. Show that the time to describe an arc of central orbit is given by

   $$t = \frac{1}{h} \int \frac{Pr}{\sqrt{r^2 - p^2}}\, dr \; .$$

3. Attempt **any one** of the following :   **5**

   i) The velocities of a particle along and perpendicular to the radius vector from a fixed origin are λ_r and $\mu\theta$. Find the path and show that the acceleration along

   and perpendicular to the radius vector are $\lambda^2 r - \dfrac{\mu^2\theta^2}{r}$ and $\mu\theta \left[\lambda + \dfrac{\mu}{r} \right]$

   ii) If the particles are projected from a point O in a vertical plane with velocity $\sqrt{2gk}$ and α as angle of projection. Prove that the locus of vertices of the paths is the ellipse.

   $x^2 + 4y\,(y - k) = 0$.

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T.Y. B.Sc. (Semester – III) Examination, 2009
MATHEMATICS (Paper – VII) (MT-337)
A) **Operations Research – I**
B) **Graph Theory**
C) **Computational Mathematics – I**
D) **Combinatorics**
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Note : 1) *Candidates are advised to see the relevant question paper and solve the same.*
2) *Use of logarithmic tables and calculators is allowed.*
3) *All questions are compulsory.*
4) *Graph paper will be supplied on demand.*
5) *Figures to the right indicate full marks.*

A) Operations Research – I

1. Attempt the following :   **10**

   i) Define a standard form of LPP.

   ii) What is the difference between slack and surplus variables.

   iii) When do we use artificial variable in simplex method ?

   iv) What is an unbalanced transportation problem ?

   v) What is the condition that the transportation problem has an alternate optimum solution ?

   vi) What is an assignment problem ?

   vii) Write two applications of duality in LPP.

   viii) True/False. Every transportation problem is an assignment problem.

   ix) Find a feasible region of the following LPP.

   Maximize $Z = x_1 + 2x_2$
   Subject to,
   $x_1 = 2, x_2 = 3$

   x) What do you mean by degeneracy in a transportation problem ?

2. Attempt **any two** of the following : **10**

   i) Wild West produces two types of cowboy hats. Type 1 hat requires twice as much labour time as does each of type 2. If all produced hats are of type 2 only, the company can produce a total of 400 hats a day. The market daily limits are 150 and 200 hats for type 1 and 2 respectively. The profit per type 1 hat is Rs. 8 and that of type 2 hat is Rs. 5. Formulate the problem as a linear programming so as to maximize the profit.

   ii) Solve the following linear programming problem by simplex method.

   Maximize $Z = 3x_1 + 2x_2 + 5x_3$

   Subject to,

   $$x_1 + 2x_2 + x_3 \leq 430$$
   $$3x_1 + 2x_3 \leq 460$$
   $$x_1 + 4x_2 \leq 420$$
   $$x_1, x_2, x_3 \geq 0$$

   iii) Determine all the basic solutions to the following system of linear equation.

   $$x_1 + 2x_2 + x_3 = 4$$
   $$2x_1 + x_2 + 5x_3 = 5$$

3. Attempt **any two** of the following : **10**

   i) Solve the following assignment problem.

		Operator				
		I	II	III	IV	V
	A	10	5	13	15	16
Machines	B	3	9	18	3	6
	C	10	7	2	2	2
	D	5	11	9	7	12
	E	7	9	10	4	12

ii) Find the initial basic feasible solution by VAM.

	1	2	3	4	Supply
1	3	4	6	3	30
2	3	5	7	10	50
3	2	6	5	7	70
Demand	22	44	41	43	

iii) Find optimal solution of the following transportation problem.

Destination

		D_1	D_2	D_3	D_4	Supply
	O_1	1	2	1	4	30
Origin	O_2	3	3	2	1	50
	O_3	4	2	5	9	20
	Demand	20	40	30	10	

4. Attempt **any one** of the following :   **10**

i) Use Big-M method to solve the following linear programming problem.

Maximize $Z = -2x_1 - x_2$

Subject to,

$$3x_1 + x_2 = 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 4$$

$$x_1 \geq 0, x_2 \geq 0.$$

ii) A company has three plants and four warehouses. The supply and demand in units and corresponding transportation cost are given with a solution.

Plants	Warehouses				Supply
	I	**II**	**III**	**IV**	
A	5	10	4 (10)	5	10
B	6 (20)	8	7	2 (5)	25
C	4 (5)	2 (10)	5 (5)	7	20
Demand	25	10	15	5	55

Answer the following questions giving reason.

a) Is this solution feasible ?

b) Is this solution degenerate ?

c) In this solution optimal ?

d) Does this problem have more than one optimal solution ? If so find an alternate solution.

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MT – 337 (B) : Graph Theory

Time : 2 Hours

Max. Marks : 40

N.B. : *1)* ***All*** *questions are* ***compulsory****.*
2) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Attempt **each** of the following :　　　　　　　　　　　　　　　　　　　**10**

    i) Define a bipartite graph.

    ii) Draw 2 non-isomorphic trees on 5 vertices.

    iii) True or False ? Justify. Every Hamiltonian graph is Eulerian.

    iv) Are the following graphs isomorphic ? Justify.

    v) Give an example of a self-complementary graph.

    vi) Draw a separable graph.

    vii) Write the incidence matrix of the following graph.
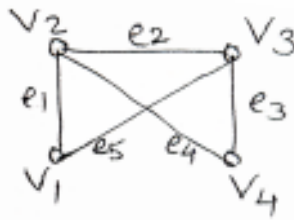
    viii) Define a directed graph.

    ix) Find the diameter of the following graph.

    x) True or False ?

    There is one and only one path between every pair of vertices in a tree.

2. Attempt **any two** of the following : **10**

   i) Prove that a connected graph G is an Euler graph if all vertices of G are of even degree.

   ii) Define an arborescence. Prove that an arborescence is a tree in which every vertex other than root has an in-degree exactly one.

   iii) Find all fundamental circuits in a graph G with respect to the spanning tree T given below.
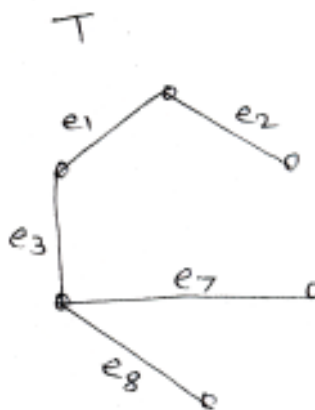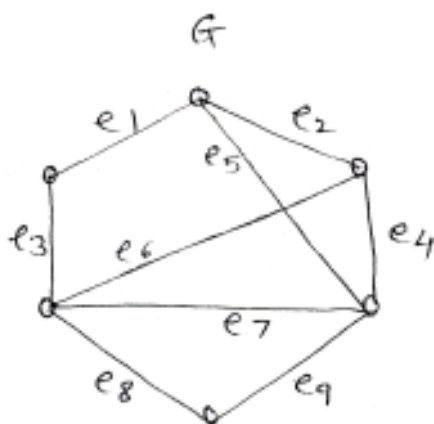
3. Attempt **any two** of the following : **10**

   i) Prove that with respect to a given spanning tree T, a branch b_i that determines a fundamental cut-set S is contained in every fundamental circuit associated with the chords in s and in no others.

   ii) If X is an adjacency matrix of graph G with n vertices and $Y = X + X^2 + ... + X^{n-1}$ then prove that G is disconnected if and only if there exists atleast one entry in matrix Y that is zero.

   iii) Draw 5 spanning trees of the following graph.
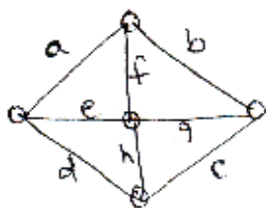
4. Attempt **any one** of the following : **10**

   i) a) Prove that a tree with n vertices has n – 1 edges.

     b) A graph G and spanning tree g_1 is given below. Write down vectors in circuit subspace and cut-set subspace. State the basis and dimension of each.
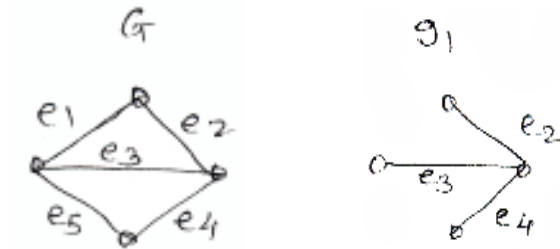
   ii) a) Define a binary tree. Let n be the total number of vertices and p be the number of pendant vertices in a binary tree T, then show that n is odd and

$$p = \frac{(n+1)}{2}.$$

     b) Define edge connectivity and vertex connectivity. Give an example of a graph in which vertex connectivity is strictly smaller than edge connectivity.

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MT – 337 (C) : Computational Mathematics – I

Time : 2 Hours   Max. Marks : 40

N.B. : i) **All** questions are **compulsory**.

   ii) Figures to the **right** indicate **full** marks.

1. Attempt **each** of the following :   **10**

   i) Which of the following are valid integer constants ?

      a) 0.12   b) 23E02

   ii) State whether the following declarations are valid.

      a) int 2nd;   b) float Roll No.;

   iii) Find the output of the following statement printf ("a = %0", 123);

   iv) Find the value of the following expression $2 * 3\% \ 4 + 5$.

   v) What is the difference between 2 and '2' ?

   vi) A C-Program contains the following declaration.

      int i;

      float x;

      Determine the data type of the following expression.

      i + x;

   vii) Find the value of x

      float x;

      $x = 13/6$

   viii) Which of the following are valid floating point constants ?

      a) 234E + 3   b) 245

   ix) Write a program to find the maximum of two numbers.

   x) Find the value of $n = 5 + (4 < 3 \ ? \ 4 + 5 : 5 + 3)$.

2. Attempt **any two** of the following : **10**

   i) Write a note on Arithmetic operators.

   ii) Write a program to reverse the digits of an integer.

   iii) Draw a flow chart to find a maximum of 3 numbers.

3. Attempt **any two** of the following : **10**

   i) Write a note on for loop.

   ii) Write a note on If-else statement.

   iii) Write a program to find area and circumference of a circle. Assume radius is given.

4. Attempt **any one** of the following : **10**

   i) a) Write a program to find gcd of two positive integers.

      b) Describe the output that will be generated by the following C-Program.

```c
# include < stdio.h >
  main ( )
  {
     int i = 0, x = 0;
  While (i < 20)
       { if (i%5 = = 0)
          { x + = i ;
             Printf ("%d", x);
          }
       ++i;
       }
     Printf ("\nx = %d", x);
     }
```

ii) a) Write a note on do-while loop.

b) Describe the output that will be generated by the following C-Program.

```
# include < stdio.h >

   main ( )
{
  int i = 0, x = 0;

  do {
       if (i%5 = = 0)

       { x + + ;

       printf ("%d", x);

       }

        ++i

     }

  while (i < 20)

  printf ("\nx = %d", x);

}
```

_____

MT – 337 (D) : Combinatorics

Time : 2 Hours   Max. Marks : 40

N.B. : *1*) *All* questions are *compulsory*.
          2) *Figures to the **right** indicate **full** marks.*

1. Attempt **each** of the following :   **10**

   i) How many ways are there to pick a sequence of two different letters of the alphabets that appear in the word 'MATHEMATICS' ?

   ii) How many non-empty collections of letters can be formed from 3 A's and 5 B's ?

   iii) Determine the number of onto functions from {1, 2, ..., n} to {1, 2}, where $n \geq 2$.

   iv) How many ways are there to arrange the six letters in the word 'BANANA' ?

   v) How many ways are there to distribute 40 identical jellybeans among 4 children without any restriction ?

   vi) Find the roots of the characteristic equation of the recurrence relation.

   $$a_n - 2a_{n-1} - 3a_{n-2} = 0, \ n \geq 3.$$

   vii) How many non-negative integer solutions are there to

   $$x_1 + x_2 + x_3 + x_4 + x_5 = 28 ?$$

   viii) How many permutations are there of the 26 letters of the English alphabet that contain the sequence 'MATH' ?

   ix) In how many ways can 10 persons be seated at a round table ?

   x) Among 600 families, 100 families have no children, 200 have only boys and 200 only girls. How many families have boys and girls ?

2. Attempt **any two** of the following : **10**

i) Show by a combinatorial argument that $\left(^nC_0\right)^2 + \left(^nC_1\right)^2 + ... + \left(^nC_n\right)^2 = {}^{2n}C_n$.

ii) Find the coefficient of x^{17} in the expansion of $(x^3 + x^4 + x^5 + ...)^3$.

iii) What is the probability that a 5-card hand has atleast one card of each suit ?

3. Attempt **any two** of the following : **10**

i) Solve the recurrence relation $a_n = 4a_{n-1} - 4a_{n-2}$; $n \geq 3$ $a_1 = 1, a_2 = 7$.

ii) How may arrangements are there of a,a,a,b,b,b,c,c,c without 3 consecutive letters being the same.

iii) Prove that in any set of 7 distinct integers, there must exist 2 integers whose sum or difference is a multiple of 10.

4. Attempt **any one** of the following : **10**

i) a) How many integer solutions are there to the equation

$x_1 + x_2 + x_3 + x_4 \leq 15$ with
$x_i \geq -10$, for $1 \leq i \leq 4$.

b) What is the probability that the sum of two randomly chosen integers between 20 and 40, both inclusive, is even ? (the possibility of two integers being equal is allowed).

ii) a) Build a generating function for a_n, the number of distributions of n identical objects into

(α) 5 different boxes, with atmost 4 objects in each box

(β) 4 different boxes with between 3 and 8 objects in each box

(γ) 7 different boxes with atleast one object in each box

(δ) 3 different boxes with atmost 5 objects in the first box.

b) A man has a staircase of n stairs to climb. Each step he takes can cove either 1 stair or 2 stairs. Find a recurrence relation for a_n, the number of different ways for the man to ascend the n-stair staircase.

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T.Y.B.Sc. (Semester – III) Examination, 2009
MATHEMATICS (Paper – VIII) (2004 Pattern)
MT – 338 (A) : Number Theory
MT – 338 (B) : Differential Geometry I
MT – 338 (C) : Computational Mathematics III
MT – 338 (D) : Astronomy I

Time: 2 Hours   Max. Marks: 40

Note : 1) Candidates are advised to see the relevant **question paper** and solve the **same**.
2) Use of logarithmic tables and calculators is **allowed**.
3) **All** questions are **compulsory**.
4) Figures to the **right** indicate **full** marks.

MT – 338 (A) : Number Theory

1. Attempt **each** of the following :   **10**

   i) If gcd (a, b) = 2 then find gcd (a, b +3a).

   ii) Prove that the square of any odd integer is of the form 8k+1.

   iii) Find all primes that divide 10!

   iv) True or false : Justify.

   If $4x \equiv 4y \pmod 6$ then $x \equiv y \pmod 3$.

   v) Prove that 19 is not divisor a of $4n^2+4$ for any integer n.

   vi) Find the smallest positive integer except x = 1 which satisfies $x \equiv 1 \pmod 3$, $x \equiv 1 \pmod 5$, $x \equiv 1 \pmod 7$, simultaneously.

   vii) Show that $x^{14}+12x^2 \equiv 0 \pmod{13}$ is an identical congruence.

   viii) How many primitive roots does the prime 11 have ?

   ix) Evaluate $\sum_{j=1}^{n} \mu(j!)$.

   x) Give an example of a Pythagorean triplet whose terms form an arithmetic progression.

P.T.O.

2. Attempt **any two** of the following : **10**

   i) Prove that there are arbitrarily large gaps in the sequence of primes.

   ii) If gcd (a, m) = 1 then prove that $a^{\phi(m)} \equiv 1 \,(\text{mod } m)$.

   iii) Using Euclidean algorithm, find integers x and y such that
      423 x + 198y = gcd (423, 198).

3. Attempt **any two** of the following : **10**

   i) Show that the congruence $f(x) \equiv 0$ (mod p) of degree n has atmost n solutions.

   ii) Let f(n) be a multiplicative function and let $F(n) = \sum\limits_{d/n} f(d)$, then prove that F(n)

      is multiplicative.

   iii) Solve the following set of simultaneous congruences.

      $x \equiv 2$ (mod 3)

      $x \equiv 3$ (mod 5)

      $x \equiv 4$ (mod 7).

4. Attempt **any one** of the following : **10**

   i) a) If x, y, z is a primitive Pythagorean triple then prove that one of the integers
       x and y is even while the other is odd.

     b) Find all integers x and y such that 101x + 99y = 437.

   ii) a) If p is a prime and (a, p) = 1 then prove that the congruence $x^n \equiv a$ (mod p)
       has (n, p – 1) solutions or no solution according as

      $a^{(p-1)/(n,p-1)} \equiv 1$ (mod p) or not.

     b) Show that $7/(3^{2n+1} + 2^{n+2})$ for all n.

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MT – 338 (B) : Differential Geometry – I

Time: 2 Hours   Max. Marks: 40

N.B. : 1) **All** questions are **compulsory**.
        2) Figures to the **right** indicate **full** marks.

1. Attempt **each** of the following :   **10**

   i) Prove that for any curve

   $$\hat{t}'.\hat{b}' = -k\tau$$

   ii) Define a helix.

   iii) Write the equation of the tangent plane to the surface.

   $$\frac{x^2}{12} + \frac{y^2}{48} + \frac{z^2}{75} = 1 \text{ at } (3, -4, 5).$$

   iv) Prove that the envelope of the family of paraboloids $x^2 + y^2 = 4a(z-a)$ is $x^2 + y^2 = z^2$.

   v) Define the term 'Bertrand Curves'.

   vi) State the condition so that the surface $z = f(x, y)$ is developable.

   vii) Define the spherical indicatrix of the tangent to a curve.

   viii) Define the term polar developable and polar line.

   ix) Prove that the curve $\bar{r}(t) = (a\sin^2 t, a\sin t\cos t, a\cos t)$ lies on a sphere.

   x) Explain the term Edge of regression.

2. Attempt **any two** of the following :   **10**

   i) Define involute of a space curve. State the equation of involute of the curve $\bar{r} = \bar{r}(s)$ and prove that $k_1^2 = \dfrac{k^2 + \tau^2}{k^2(\tau - s)^2}$.

ii) For the curve

$$x = a(3u - u^3), \ y = 3au^2, \ z = a(3u + u^3),$$

Show that $K = \tau = \dfrac{1}{3a\left(1 + u^2\right)^2}$

iii) Show that the radius of spherical curvature of a circular helix is equal to the radius of circular curvature.

3. Attempt **any two** of the following :   **10**

  i) Find the envelope of the family of planes

$$3a^2x - 3ay + z = a^3$$

and show that its edge of regression is the curve of intersection of the surfaces $xz = y^2$ and $xy = z$.

  ii) Prove that the edge of regression of the polar developable is the locus of the centre of spherical curvature.

  iii) Prove that for any curve

$$[t', t'', t'''] = k^5 \dfrac{d}{ds}\left(\dfrac{\tau}{k}\right).$$

4. Attempt **any one** of the following :   **10**

  i) a) Show that the torsion on of an involute has the value

$$\dfrac{k\tau' - k'\tau}{k(k^2 + \tau^2)(\tau - s)}$$

    b) Prove that the necessary and sufficient condition that the curve be a plane curve is $[r', r'', r'''] = 0$.

  ii) Define centralpoint and line of striction. Show that the line of striction on a hyperboloid of revolution is the principal circular section.

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MT – 338 (C) : Computational Mathematics – III

Time: 2 Hours   Max. Marks: 40

*N.B. : Use the following numerical equivalents of the **English** alphabet.*
$a \leftrightarrow 1, \ b \leftrightarrow 2, \ c \leftrightarrow 3, ..., z \rightarrow 26$.

1. Attempt **each** of the following :   **10**

   i) Find the least positive integer solution of the congruence $7x \equiv 3 \pmod{11}$.

   ii) Find a field containg 4 elements.

   iii) Evaluate the octal sum $(7346)_8 + (5263)_8$.

   iv) Find Euler's $\phi(n)$ for n = 600.

   v) Give big-O estimate for $8x^3 - 7x + 1$.

   vi) Find the number of monic irreducible polynomials of degree 5 over the field $\mathbb{Z}_2$

   vii) Encrypt the message JOIN using additive cipher with k = 5.

   viii) If the encryption transformation is given by f(n) = 7n (mod 26), then find the corresponding decryption transformation.

   ix) Define a trap door function.

   x) Find the powers of 7 that exactly divide 100!.

2. Attempt **any two** of the following :   **10**

   i) Find a 3-digit number which leaves a remainder of 4 when divided by 7, 9, or 11.

   ii) a) Evaluate $(72A4)_{16} - (4E86)_{16}$.

      b) In the base 26, with digits A-Z representing 0-25, multiply YES by NO.

   iii) Find an upper bound for the number of bit operations it takes to compute the binomial coefficient $\binom{n}{m}$.

3. Attempt **any two** of the following : **10**

    i) Let $f(x) = x^3 + x + 1$, $g(x) = x^2 + x + 1 \in \mathbb{Z}_2[x]$. Find g.c.d (f, g) using the Euclidean algorithm for polynomials; and express the g.c.d. in the form $u(x)f(x) + v(x)g(x)$.

    ii) In the 27 letter (with blank = 27) use the affine cipher with keys $a = 13$, $b = 9$ to encipher the message PAY ME NOW.

    iii) Decipher the following message which was enciphered using an additive cipher with key, $k = 10$. IOCSKWTYUSXQ.

4. Attempt **any one** of the following. **10**

    i) Using frequency analysis, decipher the following message, which was enciphered using the multiplicative cipher.

    ONOBWISPHAPKSKERKPIHASPMCWPSHFOLARROBOPACFJO.

    ii) a) Encipher the following message by a key word cipher with key word GLORY and key letter T. 'SUCCESS ATLAST'.

    b) Write a short note on RSA method of public key cryptography.

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MT – 338 (D) : Astronomy – I

Time: 2 Hours   Max. Marks: 40

N.B. : 1) *All* questions are *compulsory*.
          2) *Figures to the **right** indicate **full** marks.*

1. Attempt **each** of the following :   **10**

   i) State sine rule for spherical ΔABC.

   ii) State Napier's rule of circular parts for a spherical right angled Δ ABC.

   iii) State co-tangent formula for a spherical Δ ABC.

   iv) State any one Delambert's anology.

   v) Define right ascension of the star X.

   vi) Define Zenith and Nadir.

   vii) Define Hour angle of star X.

   viii) State three co-ordinate system used in Astronomy.

   ix) What is effect of refraction on the circular disc of the sun ?

   x) State a formula for refraction based on Simpson's hypothesis.

2. Attempt **any two** of the following :   **10**

   i) State and prove Cosine rule for spherical Δ ABC.

   ii) Two spherical ΔABC and Δ A′BC standing on the same base BC are such that $\tan B \tan C = \tan B′ \tan C′$, show that

   $$\cos A \cos B′ \cos C′ = \cos A′ \cos B \cos C \cdot$$

   iii) In a spherical Δ ABC, if $\angle C = \dfrac{\pi}{2}$ and D is middle part of AB, show that

   $$4\cos^2 {}^C\!\!/_2 \, \sin^2 CD = \sin^2 a + \sin^2 b.$$

3. Attempt **any two** of the following :   **10**

   i) Prove that the rate of change of zenith is given by $\dfrac{dz}{dH} = \sin A \cos \phi$.

   ii) If a is the sun's altitude in prime vertical at the place in latitude ϕ and L is its longitude, prove that $\phi = \sin^{-1}(\sin L.\sin \in .\mathrm{cosec}\, a)$.

   iii) Show that duration of evening twilight at a place of latitude ϕ during equinoxes is given by $\dfrac{12}{\pi}\sin^{-1}(\sin 18°\sec \phi)$.

4. Attempt **any one** of the following :   **10**

   i) By Cassini's hypothesis, obtain the formula for refraction, $R = A \tan \xi + B \tan^3 \xi$ where A, B and ξ have their usual meaning.

   ii) If δ be the declination of a star; show that if the horizontal refraction be r seconds, the time of a star's rising at place in latitude ϕ is changed approximately by number of seconds equal to

   $$\frac{r}{15\sqrt{\cos^2 \delta - \sin^2 \phi}}.$$

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T.Y. B.Sc. (Sem. – III) Examination, 2009
PHYSICS (Paper – I)
PH-331 : Mathematical Methods in Physics
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Note : 1) *All* questions are *compulsory*.
         2) *Figures to the* *right* *indicate* *full* *marks*.
         3) *Use of log tables and calculators is* *allowed*.

1. Attempt **all** of the following :   **10**

   a) Define linearity of the differential equation.

   b) What is Solenoidal vector ?

   c) State Green's 1st theorem.

   d) What do you mean by curvilinear co-ordinate system ?

   e) Write generating function for Legendre polynomials.

   f) If $\bar{v} = x^2 z \hat{i} - 2y^3 z^2 \hat{j} + xy^2 z \hat{k}$, find $\nabla \cdot \vec{v}$ at the point (1, –1, 1).

   g) Plot a graph of $\sin^{-1} x$ against x.

   h) State general properties of Fourier series.

   i) Write Laplacian operator in cylindrical coordinates.

   j) If $\phi = 3x^2 y - y^3 z^2$, find $\nabla \phi$.

2. Attempt **any two** of the following :

   a) Prove that the spherical polar coordinate system is orthogonal.   **5**

   b) Prove that $J_{n+1}(x) + J_{n-1}(x) = \dfrac{2n}{x} J_n(x)$.   **5**

   c) Show that the point $x = \infty$ is an irregular singular point of differential equation

      $y'' + w^2 y = 0$.   **5**

3. Attempt **any two** of the following :

   a) Obtain the expression for curl of a vector in orthogonal curvilinear coordinate system and express it in spherical polar coordinates. **5**

   b) Obtain the Fourier series of the function **5**

$$f(x) = \begin{cases} 0 & \text{for} \quad -\pi \le x \le 0 \\ 1 & \text{for} \quad 0 \le x \le \pi \end{cases}$$

   c) Give the generating function for Hermite Polynomials. Hence generate $H_0(x)$, $H_1(x)$ and $H_2(x)$. **5**

4. A) State and prove Gauss's divergence theorem. **8**

                OR

  A) Using Frobenius series solution method to obtain series solution of Hermite differential equation with only even power in x.

$$y'' - 2xy' + 2\lambda y = 0$$

   where λ is constant. **8**

  B) Attempt **any one** of the following :

   a) What is the degree and order of the differential equation $\dfrac{d^4 y}{dx^4} + 5 \dfrac{dy}{dx} + 7y = 0$? **2**

   b) If $\bar{r}$ is the position vector, then prove that $\iint_S \vec{r} \cdot d\vec{s} = 3\tau$ where τ is volume. **2**

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T.Y. B.Sc. (Semester – III) Examination, 2009
PHYSICS (Paper – II)
PH – 332 : Classical Electrodynamics
(2004 Pattern)

Time : 2 Hours　　　　　　　　　　　　　　　　　　　　　Max. Marks : 40

Instructions *: 1)* ***All*** *questions are* ***compulsory****.*
　　　　　　　　2) Figures to the ***right*** *indicate* ***full*** *marks.*
　　　　　　　　3) ***Use*** *of log tables and calculator is* ***allowed****.*

1. Attempt **all** of the following (**1** mark **each**) :　　　　　　　　　　**10**

   a) Explain the term 'displacement current'.

   b) Give physical significance of the equation $\vec{\nabla} \cdot \vec{B} = 0$.

   c) Define the term 'electric intensity' $\left(\vec{E}\right)$.

   d) What is 'non-polar molecule' ?

   e) State any two basic property of ideal conductors.

   f) State the equation for energy density in terms of magnetic field vectors $\vec{B}$ & $\vec{H}$ for free space.

   g) Give physical interpretation of 'Poynting vector $\left(\vec{P}\right)$'.

   h) Represent graphically transverse electromagnetic wave propagating in positive z direction.

   i) In a air medium two point charges interact with a force of 7.0×10^{-3} N. What would be the force if the charges were in a dielectric medium of constant k = 3 ?

   j) With which currents the magnetic field vector $\vec{B}$ is associated ?

2. Attempt **any two** :

   a) Write Maxwell's equations in integral form. State and explain the laws represented by these equations. **5**

   b) What do you mean by 'linearly polarized wave' ? Explain in detail circular polarization with neat diagram. **5**

   c) A point charge 'q' is placed at a distance 'd' from the centre of a grounded conducting sphere of radius 'a'. An image charge of magnitude $q' = \dfrac{-a}{d} q$ is kept at a distance $b = a^2/d$ from the centre of sphere. Find electric potential and electric field $(\vec{E})$ at an exterior point. **5**

3. Attempt **any two** :

   a) The current density in the wire of circular cross section, having radius 'a' is proportional to the distance from the axis. Show that the total current (I) through the wire is proportional to a^3. **5**

   b) Three point charges 3q, – 2q and 5q are placed at the corners of an equilateral triangle having length of each side 1.5 cm. Compute the potential energy of the structure. $\left(\text{Given } q = 1.6 \times 10^{-6} \text{ C}, \dfrac{1}{4\pi \in_0} = 9 \times 10^9 \text{ Nm}^2/C^2 \right).$ **5**

   c) The distance between the plates in parallel plate capacitor is 1.2 cm, and is fully charged by a potential of 72 V. The battery is then disconnected and a dielectric slab of thickness 1.2 cm and k = 5 is inserted in it. Find the magnitudes of $\vec{E}$, $\vec{P}$ and $\vec{D}$ in the dielectric material. **5**

4. A) Attempt **any one** :

1) Show that in charge free non-conducting medium, Maxwell's equations

    lead to $\nabla^2 \vec{E} = \dfrac{1}{c^2} \dfrac{\partial^2 \vec{E}}{\partial t^2}$

    and $\nabla^2 \vec{H} = \dfrac{1}{c^2} \dfrac{\partial^2 \vec{B}}{\partial t^2}$ **8**

2) Show that magnitude of magnetic induction at a point inside the sphere placed in uniform magnetic field $\left(\vec{B}_0 \right)$ is given by

$$| \vec{B}_z | = \frac{3\,B_0}{\left(1 + \dfrac{2\mu_0}{\mu} \right)}$$

    where the symbols have their usual meaning.   **8**

B) Attempt **any one** :

1) A point charge 2×10^{-3} C is kept near an infinite grounded conducting plane at a perpendicular distance 1.5 cm from it. Find the force acting on the point charge.   **2**

2) Find the loss of energy per hour at a frequency of 50 cycles per second, if the energy dissipated in iron per cycle is 6×10^6 erg.   **2**

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T.Y. B.Sc. (Semester – III) Examination, 2009
PHYSICS (Paper – III) (2004 Pattern)
PH-333 : Classical Mechanics

Time : 2 Hours   Max. Marks : 40

N.B. :   *i)* **All** *questions are* **compulsory**.
      ii) *Figures to the* **right** *indicate* **full** *marks*.
      iii) *Use of log tables and calculators is* **allowed**.

1. Attempt **all** of the following   (**1** mark **each**) :   **10**

    a) State any one limitation of Newtonian mechanics.

    b) The maximum height attained by the projectile is 100 m. Calculate the maximum horizontal range of the projectile.

    c) What is central force ? Give one example of central force.

    d) State Kepler's second law of planetary motion.

    e) Define angle of scattering.

    f) Write the relation between differential cross-section in Lab and C.M. Systems.

    g) What are cyclic co-ordinates ?

    h) State the constraint equation for a simple pendulum oscillating in X-Y plane.

    i) Give the difference between inertial and non-inertial frames of reference.

    j) What is coriolis force ?

2. Attempt **any two** of the following :

    a) Show that a two body problem can be reduced into equivalent one body problem under the action of central force.   **5**

    b) Define the terms impact parameter and differential cross-section. Obtain the relation between them.   **5**

    c) What are generalised co-ordinates ? Write the transformation relations between cartesian and generalised co-ordinates. State the advantages of using the generalised co-ordinates.   **5**

3. Solve **any two** of the following :

   a) A proton of mass 1.6×10^{-27} kg is initially travelling with a velocity $V_x = 5 \times 10^6$ m/s. Calculate the transverse deflection in travelling a length of 0.1 m in the electric field $Ey = 2 \times 10^4$ V/m. **5**

   b) Set up the Lagrangian for Atwood's machine. Show that the downward acceleration is given by $\ddot{x} = \left(\dfrac{m_1 - m_2}{m_1 + m_2} \right) g$. **5**

   c) Earth rotates with angular velocity $\omega = 7.27 \times 10^{-5}$ sec^{-1}. Calculate the centripetal acceleration at the equator. Also calculate the coriolis acceleration for the object moving with velocity of 10^3 m/sec. (Radius of Earth $= 6.46 \times 10^6$ m). **5**

4. A) Attempt **any one** of the following :

   a) What do you mean by elastic scattering process. Discuss the elastic scattering between two particles in Lab and C.M. systems. **8**

   b) What is variable mass system ? Obtain an equation for the instantaneous velocity of the rocket under the action of gravitational field. **8**

   B) Solve **any one** of the following.

   a) An electron is subjected to uniform magnetic field of induction 2×10^{-3} wb/m^2. in transverse direction. Calculate the frequency of rotation of electron. **2**

   b) A particle of mass 'm' moves with linear velocity $\vec{V}$ in a circular orbit of radius r under the action of central force $\vec{f} = -\dfrac{k\vec{r}}{r^3}$. Find the angular momentum of the particle. **2**

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T.Y. B.Sc. (Semester – III) Examination, 2009
PHYSICS (Paper – V)
PH – 335 : Optics, Lasers and Relativity (Optional)
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
2) Figures to the **right** indicate **full** marks.
3) **Use** of log tables and calculators is **allowed**.

1. Attempt **all** of the following (**one** mark **each**) :   **10**

   a) State Einstein's second postulate in the special theory of relativity.

   b) Mention any two uses of Michelson's interferometer.

   c) Calculate grating element of a plane diffraction grating having 20000 lines per inch.

   d) Define destructive interference.

   e) State any two properties of LASER.

   f) Define coherent sources.

   g) Define population inversion.

   h) Define internal frame of reference.

   i) Is the principle of reversibility valid in optics ?

   j) Which light source is used in advertising display ?

2. Attempt **any two** :

   a) Describe an experimental arrangement using Michelson's interferometer to determine a very small difference between two monochromatic light waves.   **5**

   b) Explain the three level pumping scheme with the help of a diagram.   **5**

   c) Derive an expression for variation of mass with velocity.   **5**

3. Attempt **any two** :

   a) Explain the construction and working of an 'interference filter'. **5**

   b) For a sodium lamp, the distance traversed by the mirror between two successive disappearances is 0.289 mm. Calculate the difference in the wavelengths of the D_1 and D_2 lines using Michelson interferometer. Assume $\lambda = 5890$ A$^\circ$. **5**

   c) Consider a diffraction grating with 15000 lines per inch. Show that if we use a white light source the second and third order spectra overlap. Assume wavelength for violet and red colours are 4×10^{-5} cm and 7×10^{-5} cm respectively. **5**

4. A) Attempt **any one** :

   a) Deduce the expression for 'Time dilation and Length contraction'.

   b) Describe the construction and theory of Febry-Perot interferometer. **8**

   B) Attempt **any one** :

   a) Enlist any four application of a LASER. **2**

   b) Calculate the relativistic energy of an electron having a velocity 0.9c. Assume rest mass of electron is $m_0 = 9.1\times10^{-31}$ kg .

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PHYSICS (Paper – V)
PH – 335 : 'C' Programming and Computational Physics (New)
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.
          2) *Figures to the right indicate full marks.*
          3) *Flow charts may be drawn with pencil.*

1. Attempt **all** of the following (**one** mark **each**) :   **10**

   a) Define Pseudocode.

   b) State the different types of operators.

   c) What do you mean by nested loop ?

   d) Give the syntax of printf function.

   e) What is an inherent error ?

   f) Give the use of close graph ( ) function.

   g) State the types of constants in 'C'.

   h) What do you mean by keywords ?

   i) State the general quadratic formula for Numerical Integration.

   j) Write a syntax of 'main' function.

2. Attempt **any two** of the following :

   a) What are the symbolic constants ? State the different rules to define symbolic
      constants.   **5**

   b) Explain getchar and putchar functions with suitable example.   **5**

   c) Explain do-while loop. How it differs from a while loop ?   **5**

3. Attempt **any two** of the following :

   a) What is function prototype ? Illustrate with an example. **5**

   b) Write a 'C' program to draw circle, arc, ellipse, bar and rectangle. **5**

   c) Explain the for loop with example. **5**

4. A) Attempt **any one** of the following :

   a) A rocket is launched from the ground, its acceleration measured every five second is tabulated below. Find the velocity of rocket at 40 seconds using Trapezoidal rule as well as Simpson's $\frac{1}{3}$rd rule.

t (s)	0	5	10	15	20	25	30	35	40
α	40	45.25	48.5	51.25	54.35	59.48	61.5	64.3	68.7

   8

   b) i) Write a 'C' program to find sum of digits in a given integer. **4**

   ii) Draw a flow chart to find root of equation by Bisection method. **4**

   B) Attempt **any one** of the following :

   i) What is the difference between break and continue statement. **2**

   ii) State the output of the following program. **2**

   ```
   # include < stdio.h >
     main ( )
     {
      char name [ ] = "Pune";
      int i = 0;
      while (name [i] ! = '\0');
      {
      printf ("% C", name[i]);
      i + +;
      }
     }
   ```

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T.Y. B.Sc. (Semester – III) Examination, 2009
PHYSICS (Paper – VI (A)) (2004 Pattern)
PH – 336 : Astronomy and Astrophysics – I (Ele. – I) (Gr. – A)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
         2) *Figures to the **right** indicate **full** marks.*
         3) *Draw **neat** diagrams **wherever** necessary.*

1. Attempt **all** of the following questions (**1** mark **each**):   **10**

   a) What is meant by an Albedo of a Planet ?

   b) State Bode's Law.

   c) On which principle does a CCD camera work ?

   d) What is meant by λ_{max} in Wein's Law ?

   e) How is a transit different from occultation ?

   f) What is meant by Apparent Luminosity of a star ?

   g) What is Universal Time ?

   h) What are variable stars ?

   i) On which physics principle does Image Intensifier work ?

   j) Which kind of telescope is HST ?

2. Attempt **any two** of the following :

   a) How are distances to stars measured ?   **5**

   b) Distinguish between sidereal and sydonic time.   **5**

   c) Explain the Phenomenon of Limb Darkening with a neat diagram.   **5**

3. Attempt **any two** of the following :

   a) Explain the terms : Meteors, Meteoroids and Meteorites.   **5**

   b) What is the significance of Doppler effect in Astronomy ?   **5**

   c) Describe various photospheric phenomenon occurring on the solar surface.   **5**

4. Attempt **any one** of the following :

   A) a) What are the advantages of Radio Telescopes over Optical Telescopes ?   **8**

      b) Describe the sun spot cycle in detail.   **8**

   B) Attempt **any one** of the following :

     i) Calculate the distance in A.U. of Jupiter from sun using Bode's Law.   **2**

     ii) A Star emits its λ_{max} at 5800 $\overset{\circ}{A}$ what is its surface temperature ?   **2**

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PHYSICS (Paper – VI (B))
PH – 336 : Biophysics – I (Ele. – I) (Gr. – A)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.

2) *Figures to the* **right** *indicate* **full** *marks.*

3) *Draw* **neat** *diagram* **wherever** *necessary.*

1. Attempt **all** of the following (**each** for **one** mark):   **10**

   a) Describe salient features of RNA.

   b) What is bound water ?

   c) Define active transducer.

   d) What does ATP stand for ?

   e) State function of mitochondria.

   f) Give formula of lactose.

   g) State different types of biopotential electrodes.

   h) Define conduction velocity.

   i) Define half cell potential.

   j) What is semipermeable membrane.

2. Attempt **any two** of the following :

   a) Explain -Electromyogram.   **5**

   b) Explain polarizable and non polarizable electrodes.   **5**

   c) What is role of water in a cell ? Explain.   **5**

3. Attempt **any two** of the following :

   a) State and explain Ficber's projection formula. **5**

   b) Explain working of LVDT. **5**

   c) What is DNA ? Explain primary structure of DNA. **5**

4. A) Attempt **any one** of the following :

   a) What is ECG ? Draw block diagram of ECG and explain function of each block. **8**

   b) Explain Biopotential amplifier. Draw its frequency characteristics. Explain temperature stability of amplifier. **8**

  B) Attempt **any one** of the following :

   i) How resting potential is calculated using equivalent circuit ? **2**

   ii) Give the uses of transducers in Biophysics. **2**

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PHYSICS (Paper – VI (C))
PH – 336 : Communication Electronics – I (Ele. – I) (Gr. – A)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.

2) *Figures to the* **right** *indicate* **full** *marks.*

3) **Use** *of calculators and log-tables are* **allowed**.

1. Attempt **all** of the following (**one** mark **each**):   **10**

   a) Define frequency modulation.

   b) What do you mean by multiplexing ?

   c) State the need of modulation.

   d) How noise differs from signal ?

   e) Give the different types of filter.

   f) What is FDM and TDM ?

   g) For frequency modulation, which method is mostly preferred ?

   h) What is parabolic reflector ?

   i) What is the need of electronic filters ?

   j) Why amplification is necessary in context of signal to noise ratio ?

2. Attempt **any two** of the following :

   a) How amplitude modulation takes place in case of class C amplifier ? Explain.   **5**

   b) Write a short note on PCM.   **5**

   c) What are different types of antenna ? Explain ferrite rod antenna.   **5**

3. Attempt **any two** of the following :

   a) How RC circuit can be used as a low pass filter ? **5**

   b) Explain the concept of duty cycle. **5**

   c) State different characterisitcs of antenna. Explain any two of them. **5**

4. A) Attempt **any one** :

   a) With the help of neat circuit diagram, explain Foster Seely descriminator. **8**

   b) Describe Yagi antenna. Where it is used ? Show its radiation pattern. **8**

   B) Attempt **any one** :

   a) Explain radiation resistance of antenna. **2**

   b) Draw a neat diagram showing Earth's atmospheric layers. **2**

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PHYSICS (Paper – VI (D))
PH – 336 : Electro-Acoustics and Entertainment Electronics – I

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
       2) Figures to the **right** indicate **full** marks.
       3) **Use** of calculators and log-tables is **allowed**.

1. Attempt **all** of the following (**one** mark **each**):   **10**

   a) Explain the term SPL.

   b) Define PWL.

   c) Define Reverberation time.

   d) Define coefficient of transmission.

   e) State the relation between acoustic impedance and specific acoustic impedance.

   f) Define volume coefficient of elasticity.

   g) Explain specific flow resistance.

   h) State application of acoustic filter.

   i) Define porosity in acoustics.

   j) State Eyring's formula.

2. Attempt **any two** of the following :

   a) Derive the Sabine equation for Reverberation time.   **5**

   b) What are acoustical analysis ? Obtain the formula for the frequency of resonance of the Helmholtz resonator.   **5**

   c) Reverberation time of the small auditorium (12×8×5 meters) is found to be 1.4 seconds, when empty. Determine new reverberation time when auditorium has 20 persons present. Assume an absorption of 0.5 metric sabine per person.   **5**

3. Attempt **any two** of the following :

   a) Discuss the theory of side branch in a pipe with neat diagram.   **5**

   b) Explain the working of an expansion chamber muffler.   **5**

   c) Discuss the transmission of plane wave from one fluid medium to another at normal incidence.   **5**

4. A) Attempt **any one** of the following :

   a) Discuss the tests to be carried out for acoustical evaluation of an auditorium.   **8**

   b) Discuss various types of noise control measures.   **8**

   B) Attempt **any one** of the following :

   a) Explain directivity index and directivity factor.   **2**

   b) Define characteristic impedance.   **2**

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PHYSICS (Paper – VI (E))
PH – 336 : Medical Instrumentation – I (Ele. – I) (Gr. – A)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.

2) *Figure to* **right** *indicates* **full** *marks*.

3) **Draw** *neat diagram* **wherever** *necessary*.

1. Attempt **all** of the following :   **10**

   a) Define high pass filter.

   b) What do you mean by impedance ?

   c) Give any two features of medical instruments.

   d) Give use of spectrophotometer.

   e) Draw bridge circuit for measurement of resistance.

   f) What is active transducer ?

   g) What is electrophoresis ?

   h) State use of chromatography.

   i) What is resting potential ?

   j) What do you mean by ECG ?

2. Attempt **any two** of the following :

   a) Discuss macro and microshock hazards.   **5**

   b) Write short note on piezoelectric transducer.   **5**

   c) Explain blood gas and acid base measurement.   **5**

3. Attempt **any two** of the following :

   a) Explain haematology in detail. **5**

   b) Discuss ideal characteristics of OPAMP. **5**

   c) Why are instruments essential in electronics ? **5**

4. A) Attempt **any one** of the following :

    a) What do you mean by Heart sound ? What is its significance ? **8**

    b) What are bio-potential electrode ? Describe microelectrode in detail. **8**

   B) Attempt **any one** of the following :

   a) What do you mean by pacemaker **2**

   b) What is CMRR ? **2**

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PHYSICS (Paper – VI (F))
PH – 336 : Motion Picture Physics – I

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.

2) *Figures to* **right** *indicate* **full** *marks.*

3) **Draw** *neat diagrams* **wherever** *necessary.*

1. Attempt **all** of the followings :   **10**

   a) Write shutter speed scale.

   b) What is flat perspective ?

   c) Draw diagram of condenser enlarger.

   d) What is film format ?

   e) What is use of telephotolens in photography ?

   f) What is resolving power ?

   g) Write D-163 formula.

   h) List the filters.

   i) List the lights which are used in photography.

   j) What is angle of view ?

2. Attempt **any two** of the following :

   a) Explain film format in detail.   **5**

   b) Draw S.L.R. camera and explain advantages.   **5**

   c) Write note on projection printing.   **5**

3. Attempt **any two** of the following :

 a) Explain leaf shaped shutter.   **5**

 b) Explain any two filters in detail.   **5**

 c) Explain developer formula.   **5**

4. A) Attempt **any one** of the following :

  a) Explain processing of B/W -ve film.   **8**

  b) Explain filters in detail.   **8**

 B) Attempt **any one** of the following :

 a) Draw TLR camera.   **2**

 b) Define depth of field.   **2**

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PHYSICS (Paper – VI (G))
PH – 336 : Renewable Energy Sources – I

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.

    2) **Use** of log tables and calculators **allowed**.

    3) Figures to the **right** indicate **full** marks.

1. Attempt **all** of the following: **10**

   a) What are the characteristics of thermal energy storage system ?

   b) What is Bio-Mass ?

   c) What are conventional energy sources ?

   d) Define phase change energy storage ?

   e) Which factors affect nature of wind close to surface of earth ?

   f) What are advantages of wind energy ?

   g) Draw schematic diagram of direct, diffuse and total solar radiation.

   h) Write the energy balance equation of flat plate collector.

   i) Define efficiency of 'flat plate collector'.

   j) What are the principal components of solar dryer ?

2. Attempt **any two** of the following :

   a) Write a note on solar pond.   **5**

   b) State the advantages of renewable energy sources. Explain use of hydrogen as
      potential source of energy.   **5**

   c) Discuss environmental degradation due to use of conventional energy.   **5**

3. Attempt **any two** of the following :

   a) Define terms : **5**

      i) Aperture   ii) Acceptable Angle   iii) Concentration ratio of concentrating collectors.

   b) Draw and explain the spectral distribution curve of solar radiations at the earth's surface. **5**

   c) Explain the working of box type solar cooker with help of neat diagram. **5**

4. A) What do you mean by basic earth solar angles and derived solar angles ? Explain how average daily global radiation is estimated at specific location ? **8**

<div align="center">OR</div>

A) Explain the effect of selective coating on liquid flat plate collector. **8**

B) Attempt **any one** :

   i) Calculate efficiency of flat plate collector.
      Given $Q_u = 400$ kcal/hr/$A_c = 2m^2$ $I = 500$ kcal/hr m^2. **2**

   ii) Calculate Sun's declination at 7.30 a.m. solar time on July 15. **2**

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[3617] – 314

PHYSICS (Paper – VI (H))
PH – 336 : Basic Microprocessor and Programming – I (Ele. – I) (Gr. – A)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.

2) Figures to the **right** indicate **full** marks.

3) **Use** of log-tables and calculators is **allowed**.

1. Attempt **all** of the following (**one** mark **each**):   **10**

   a) Define encoders.

   b) What is tristate switch ?

   c) Define multiplexer.

   d) Describe the function of the READY in μp 8085.

   e) What is SIPO and PISO ?

   f) What do you mean by ASCII code ?

   g) Define resolution of D/A converters.

   h) What do you mean by RAM, ROM, PROM and SPROM.

   i) Convert $(10111011)_2$ to HEX.

   j) Substract $(3B)_{16}$ from $(77)_{16}$.

2. Attempt **any two** :

   a) Using JK flipflop explain the working of MOD-5 counter.   **5**

   b) Draw and explain ALU section of μp 8085.   **5**

   c) Draw and explain 1 to 4 line demultiplexer.   **5**

3. Attempt **any two** :

   a) Explain the operation of 4 bit SISO shift register. Draw the timing diagram.   **5**

   b) Explain seven segment display. Draw the circuit diagram of common cathode seven segment display.   **5**

   c) Define different types of counters and explain the working of 4 bit asynchronous counter.   **5**

4. A) Attempt **any one** :

   a) Draw the functional block diagram of $\mu p 8085$.   **8**

   b) Write a short note on semiconductor memories.   **8**

  B) Attempt **any one** :

   a) Convert $(23.25)_{10}$ to binary number.   **2**

   b) Convert $(227)_{10}$ to Hex number.   **2**

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[3617] – 314

PHYSICS (Paper – VI (I))
PH – 336 : Auxiliary Electronics – I (Ele. – I) (Gr. – A)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.

      2) Figures to the **right** indicate **full** marks.

      3) **Use** of calculator and log-table is **allowed**.

1. Attempt **all** of the following (**one** mark **each**):   **10**

   a) What is LVDT ?

   b) Define an efficiency of transformer.

   c) What is multimeter ?

   d) State various types of capacitor.

   e) What is self induction ?

   f) What is the use of photo resist ?

   g) What is a thermocouple ?

   h) State advantage of digital multimeter over analog multimeter.

   i) What is thermister ?

   j) State two losses in transformer.

2. Attempt **any two** of the following :

   a) Explain screen printing technique in making of PCB.   **5**

   b) Explain Hysterisis losses in transformer.   **5**

   c) What are electrolytic and non-electrolytic capacitors ? How they differ from
      mica capacitor.   **5**

3. Attempt **any two** of the following :

   a) What is the need of triggering in CRO. **5**

   b) Write a short note on tweeter and woofer. **5**

   c) Draw the block diagram of D.V.M. Explain each block separately. **5**

4. A) Attempt **any one** of the following :

   a) i) Calculate the reactance of capacitor of value 4 μf at frequency 50 Hz. **8**

   ii) What is mutual inductance ?

   b) i) What is the difference between electrolytic and non-electrolytic capacitor ? **8**

   ii) At a frequency of 50 Hz, the inductor offers a reactance of 2000Ω, calculate the value of inductance.

   B) Attempt **any one** of the following :

   a) If the resistance of resistor is 470 kΩ and tolerance $\pm$10%. Write colour bands of resistor. **2**

   b) Explain temperature of inversion in thermocouple. **2**

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[3617] – 314

PHYSICS (Paper – VI (J))
PH – 336 : Elements of Material Science

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.

2) *Figures to the* ***right*** *indicate* ***full*** *marks.*

3) ***Use*** *of calculator and logtable is* ***allowed***.

1. Attempt **all** of the following (**one** mark **each**):   **10**

   a) What are the thermal properties of materials ?

   b) Define dielectric strength of materials.

   c) State the parameters which affects diffusivity of materials.

   d) Give any one advantage of alloy.

   e) State any two uses of polymers.

   f) What is the advantage of cold working ?

   g) Name any two types of linear polymers.

   h) Give any one example of magnetic ceramic.

   i) What are the co-ordinates of phase diagram ?

   j) State Gibb's phase rule.

2. Attempt **any two** of the following :

   a) What is hot working ? Explain the effects of hot working on metals.   **5**

   b) What is polymerization ? Distinguish between addition and condensation
      polymerization.   **5**

   c) What are ceramic phases ? Discuss the characteristic features of ceramic
      materials.   **5**

3. Solve **any two** of the following :

a) A copper has resistivity of $17\times10^{-9}\,\Omega$ m. Calculate i) end to end resistance of strip of length 2×10^{-2} m and cross-sectional area 5×10^{-6} m^2 ii) Conductivity of strip. **5**

b) The diffusivity of Al in Cu is 2.6×10^{-17} m^2/sec at 500°C and 1.6×10^{-12} m^2/sec at 1000°C. Determine the values of D_0 and E (K = 13.8×10^{-24} J/atom °K. **5**

c) A brine contains 9% NaCl (91% H_2O by weight). How many grams of water (per 100 gm brine) must be evaporated before the solution becomes saturated at 50°C ? (Solubility of NaCl in brine =27% at 50°C). **5**

4. A) Attempt **any one** of the following :

a) What is deformation ? Compare between elastic and plastic deformation. Explain the mechanics of plastic deformation. **8**

b) What are imperfections in crystals ? Explain the point, line and surface defects in crystals. **8**

B) Attempt **any one** of the following :

a) The degree of polymerization of polyethelene is 800. Calculate the molecular weight of chain. **2**

b) Give the classification of phase diagrams. **2**

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[3617] – 314

PHYSICS (Paper – VI (K))
PH – 336 : Vacuum Technology

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.

2) *Figures to the right indicate full marks.*

3) *Use of log-tables and calculators is allowed.*

1. Attempt **all** of the following (**one** mark **each**):   **10**

   a) What is degassing ?

   b) Define pump down time.

   c) What is ultimate pressure ?

   d) State the use of gaskets.

   e) Define mean free path.

   f) Give the use of liquid nitrogen in vacuum systems.

   g) What are true leaks ?

   h) Explain the term adsorption.

   i) Define the impedance of vacuum line.

   j) Give two units of vacuum measurement.

2. Attempt **any two** of the following :

   a) Explain the construction and working of sorption pump with neat diagram.   **5**

   b) Explain the construction and working of pirani gauge with neat diagram.   **5**

   c) Describe mercury U-type manometer.   **5**

3. Attempt **any two** of the following :

   a) Determine the effective pump speed for the pump of speed 80 litre per second with conductance of 60 litre per second. **5**

   b) Describe the different types of O-rings and their designs. **5**

   c) Describe Helium leak detector. **5**

4. A) Attempt **any one** of the following :

    a) Explain principle, construction and working of cold cathode gauge. **8**

    b) What are seals ? Explain the classification of seals based on their use in vacuum systems. **8**

  B) Attempt **any one** of the following :

   a) Explain the term Air throughput. **2**

   b) Explain the principle of penning gauge. **2**

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PHYSICS (Paper – VI (L))
PH – 336 : LASERS

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.

         2) *Figures to the* **right** *indicate* **full** *marks.*

         3) **Use** *of log-tables and calculator is* **allowed**.

1. Answer **all** of the following questions (**one** mark **each**):   **10**

    a) What is meant by spontaneous and stimulated emission ?

    b) What is the use of Xenon flash tube in a Ruby Laser ?

    c) Why is pumping action necessary in a Laser ?

    d) What is the difference between a Pulsed Laser and a continuous Laser ?

    e) Laser light is coherent, what does this mean ?

    f) What are Metastable states ?

    g) What is meant by Laser Fusion Process ?

    h) What do you understand by beam divergence ?

    i) What is Holography ?

    j) List various types of Lasers.

2. Attempt **any two** of the following :

    a) Draw a neat labelled diagram of a He-Ne Laser.   **5**

    b) Explain what is population Inversion why is it necessary ?   **5**

    c) What is the importance of N_2 atoms in a CO_2 Laser ?   **5**

3. Attempt **any two** of the following :

   a) What do you mean by "lateral coherence width"? considering sun as a source of light with $\theta = 32'$ and taking mean wavelength $\lambda = 5000\,AU$. Find Lateral coherence length. **5**

   b) A Laser beam of wavelength 6000 AU has a coherence time 4×10^{-10} sec. Calculate the order of magnitude of its : **5**

      Coherence length and Monochromaticity of the beam.

   c) Briefly describe the use of Laser in Medicine. **5**

4. A) Attempt **any one** of the following :

      i) Explain in details the vibrational modes in case of a resonator. **8**
      ii) Explain the process of recording a Hologram. **8**

   B) Attempt **any one** of the following :

      i) What is the role of chromium atoms in a Ruby Laser ? **2**

      ii) What do you mean by Light Amplification in a Laser ? **2**

   _____

T.Y. B.Sc. (Semester – III) Examination, 2009
CHEMISTRY (Paper – I)
CH-331 : Physical Chemistry (2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.

2) *Figures to* **right** *indicate* **full** *marks.*

3) **Use** *of logarithmic table and calculator is* **allowed**.

4) *Actual* **calculations** *must be shown while solving problems.*

5) **Use** *the following data* **wherever** *necessary to solve the problems :*

$N = 6.023 \times 10^{23} \ mole^{-1}$

$C = 3 \times 10^{10} \ cm.sec^{-1}$

$h = 6.625 \times 10^{-27} \ erg.sec.$

$R = 2.0 \ cal \ mole^{-1} \ K^{-1}$

$e = 4.8 \times 10^{-10} \ e.s.u.$

1. Answer the following :   **10**

a) Define the rate of reaction.

b) Define the term dipole moment.

c) Define the term axis of symmetry.

d) State Grotthus Draper Law.

e) What is the overall order of reaction which obey the rate law ?

$Rate = [A]^{\frac{1}{4}} [B]^{\frac{3}{4}} [C]^{1}$

f) What is optical exaltation ?

g) The rotational spectrum of HF has series of equidistant lines at 41.9 cm^{-1}. Calculate the value of rotational constant.

h) The half life of ^{14}C is 5580 years. What is its rate constant ?

i) For face centered cubic lattice d_{100} is 2.867×10^{-8} cm. Calculate the length of unit cell.

j) A certain system absorbs 5×10^{-4} Einstein of light in a given time. It is observed that one millimole of the substance has reacted in the same time. Calculate the quantum yield.

P.T.O.

2. A) Attempt the following (**any two**) : **6**

   i) Distinguish between order and molecularity of a chemical reaction.

   ii) What are stokes and antistokes lines in Raman Spectra ?

   iii) Sketch (100) planes of simple cubic, body centered cubic and face centered cubic lattice.

   B) Solve **any one** of the following : **4**

   i) Density of Aluminium crystal is 2.79 cm^{-3} and distance between 100 plane is 2.025×10^{-8} cm, calculate Avogadro's number. Atomic weight of aluminium is 27. Aluminium crystallises in F.C.C. lattice.

   ii) The absorbance of 1.8×10^{-3} M solution of a sample was found to be 0.20 at a wave length 470 nm, in a cell of 1.3 cm path length. Find
      i) molar extinction coefficient ii) transmittance.

3. Answer **any two** of the following : **10**

   i) Derive the Arrhenius equation, useful to calculate the energy of activation from two rate constants at two different temperatures. How is the energy of activation calculated graphically ?

   ii) Derive the Bragg's equation $n\lambda = 2d \sin \theta$.

   iii) What are the induced and orientation polarization of polar and non polar molecules ? Give the relationship with dielectric constant, refractive index and polarizability.

4. A) Explain the terms : fluorescence, phosphorescence and chemiluminescence. **6**

   OR

   A) Discuss briefly rotational spectra of simple diatomic molecule. **6**

   B) Solve **any one** of the following : **4**

   i) In a unimolecular reaction the time required for completion of 50% reaction was 150 minutes. What will be the time required for completion of 40% reaction ?

   ii) Calculate the percentage ionic character of HBr from the following data. Dipole moment of HBr = 0.79 D. Bond length of HBr = 1.42×10^{-8} cm.

_____

T.Y. B.Sc. (Semester – III) Examination, 2009
CHEMISTRY (Paper – II)
CH-332 : Inorganic Chemistry (2004 Pattern)

Time: 2 Hours　　　　　　　　　　　　　　　　　　　Max. Marks: 40

Instructions : 1) **All** questions are **compulsory**.
　　　　　　　2) Figures to **right** indicate **full** marks.
　　　　　　　3) Actual calculations must be shown while solving the **problems**.
　　　　　　　4) Marks are reserved for **neat** and labelled diagrams.
　　　　　　　5) **Use** of log table and calculator is **allowed**.
　　　　　　　6) Atomic numbers : He = 2, C =6, O=8, Sc = 21, Mn = 25, Fe = 26.

1. Answer the following :　　　　　　　　　　　　　　　　　　　**10**

　I) Which molecular orbital has a node perpendicular to the bond axis ?

　II) Why He_2 molecule does not exist ?

　III) What is the oxidation number of Co in $[Co(NH_3)_3 Cl(CN) (NO_2)]$?

　IV) Why $[Pt(NH_3)_2 Cl_4]$ is non-electrolyte ?

　V) What type of isomerism is present in $[Co(NH_3)_5 Br]SO_4$ and $[Co(NH_3)_5 SO_4)Br$?

　VI) Whether the complex $[Fe(CO)_5]$ follows the EAN rule or not ?

　VII) Draw the d-orbitals which have their lobes along the axis ?

　VIII) What is the electronic configuration of d^7 system in strong octahedral field complex in terms of t_{29} and e_9 ?

　IX) What is the CFSE of the octahedral complex with Sc^{+3} metal ion ?

　X) What is the symmetry symbol for d-orbitals directed in between the axis ?

2. A) Write short note on **any two** of the following :　　　　　　　　　**6**
　　I) LCAO principle.
　　II) Nephelauxetic effect and series.
　　III) Coordination position isomerism.

B) Answer **any two** of the following : **4**

   I) Write the formula for each of the following complexes.

     a) Tris (ethylenediamine) nickel (II) chloride.

     b) Dicyanoargentate (I) ion.

   II) Write the postulates of Werner's theory.

   III) Which of the following complex has higher value of 10 Dq ? Why ?

     $[Co(CN)_6]^{-3}$ and $[Co(NH_3)_6]^{3+}$

3. Answer **any two** of the following : **10**

  I) Explain bonding, structure and magnetic properties of $[Fe(CN)_6]^{-3}$ on the basis of VBT.

  II) Explain the Jahn-Teller theorem with a suitable example.

  III) Explain the M.O. treatment of bonding in an octahedral complex without π-bonding with a suitable example.

4. A) 'CO$^+$ has slightly stronger bond than CO itself', Explain with MO theory. **6**

            OR

A) Answer the following : **6**

  I) For Mn^{3+} ion, the electron pairing energy P is 28,000 cm^{-1}. The crystal field energy of Mn(III) octahedral complexes with the aquo and cyanide ligand are 21,000 cm^{-1} and 38500 cm^{-1} respectively. Calculate CFSE. State which complex is high spin and which complex is low spin ?

  II) What are the merits and demerits of Sidgwick theory ?

B) Discuss the inner and outer orbital complexes with suitable example. **4**

            OR

B) Distinguish between the following : **4**

  I) σ-MOs and π-MOs.

  II) Metal complex and chelate.

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T.Y.B.Sc. (Semester – III) Examination, 2009
CHEMISTRY
CH-333 : Organic Chemistry (Paper – III)
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.
          2) *Figures to the right indicate **full** marks.*
          3) ***Draw*** *structures and neat diagrams **if necessary**.*

1. Answer the following :   **10**

    i) How will you convert bad leaving group -OH into good leaving group ?

    ii) Draw all possible resonating structures of nitrobenzene.

    iii) 1, 1-Dimethyl cyclohexane is optically inactive. Why ?

    iv) Monochloroacetic acid is stronger acid than acetic acid. Explain.

    v) Give correct name and structure of THF or DMF.

    vi) Write the intermediate during the addition of alkaline $KMnO_4$ to cis-2-butene.

    vii) Arrange the following acids in the increasing order of their acid strength :

    $CH_3 - CH_2 - COOH, HC \equiv C - COOH, CH_2 = CH - COOH,$
    $CH_3 - CH_2 - CH_2 - COOH$

    viii) Anisole on nitration gives 4-nitroanisole as a major product. Why ?

    ix) What is nucleophilic substitution reaction ?

    x) Why does propene on ozonolysis gives formaldehyde as one of the products ?

2. A) Answer **any two** of the following :   **6**

    i) What is hydrogenation ? Discuss the mechanism of hydrogenation of propylene in the presence of metal catalyst.

    ii) What is hydrogen bonding ? Explain why O-hydroxy benzoic acid is stronger acid than P-hydroxy benzoic acid.

    iii) What is diazonium salt ? How is it prepared ? Explain diazonium coupling reaction with tertiary amine.

B) Attempt **any two** of the following :   **4**

    i) Draw zig-zag structures of the following molecules :

      a) Lysine   b) Methoxy ethane

      c) Tertiary butyl alcohol   d) 2, 2-dimethyl-1-propanol.

    ii) Explain the term 'Nucleophilic catalysis' with suitable example.

    iii) What are limitations of Friedal-Craft alkylation reaction ? Explain each with one example.

3. Attempt **any two** of the following :   **10**

    i) What is nitration ? Discuss the mechanism of nitration of benzene. Explain the meaning of KH = KD.

    ii) Draw all possible chair conformations of 1, 4-dimethyl cyclohexane. Comment on their stability and optical activity.

    iii) What is SN^1 reaction ? Discuss the mechanism and stereochemistry of SN^1 reaction with suitable example.

4. A) What is β-elimination reaction ? Discuss the mechanism of E2 reaction with suitable example. Give one evidence supporting E2 reaction.   **6**

                 OR

  A) What is inductive effect ? What are different types of inductive effect ? How does inductive effect affects strength of acids ?

  B) Answer the following :   **4**

    i) What is Hofmann elimination ? Explain with one example.

    ii) Explain the peroxide effect with one suitable example.

                 OR

  B) Predict the major products and rewrite the following equations :

    i) $Ph - CH_2 - \underset{\underset{CH_3}{|}}{CH} - Cl \xrightarrow{\text{Alcoholic KOH}} ? \xrightarrow[\text{ii) H}_2\text{O/Zn}]{\text{i) O}_3} ?$

    ii) $\xrightarrow[\text{addition}]{\text{Diels–Alder}} ? \xrightarrow{H^{\oplus}/\text{MeOH}} ?$

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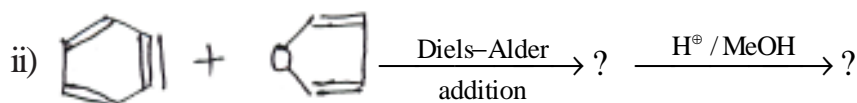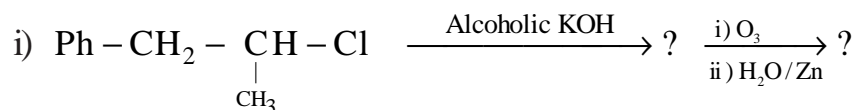
T.Y. B.Sc. (Semester – III) Examination, 2009
CHEMISTRY (Paper – IV)
CH-334 : Analytical Chemistry
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory.***
2) *Figures to the* ***right*** *indicate* ***full*** *marks.*
3) ***Use*** *of log table and calculator is* ***allowed.***
4) ***Nea****t and labelled diagrams must be drawn* ***wherever***
necessary.

1. Answer the following :   **10**

   1) Draw the structure of 8-hydroxy quinoline.

   2) Mention different type of fuels used in FES.

   3) What is the principle of thermal conductivity detectors used in GLC ?

   4) What do you mean by salting out agents ?

   5) Calculate the turbidence if the transmittance (T) is 0.358.

   6) Which electrodes are used for pH measurement by pH meter ?

   7) Give the principle of Nephelometry.

   8) Give the formula for number of theoretical plates in GC.

   9) Define the term interference in atomic absorption spectroscopy.

   10) Define the term thermogravimetry.

2. a) Attempt **any two** of the following :   **6**

   1) What is digetion ? Give its advantages.

   2) Discuss flame ionisation detectors used in GC.

   3) Explain the principle of flame photometry.

b) Answer **any two** of the following : **4**

1) Discuss the determination of molecular weight of high polymer by turbidimetry.

2) The solubility of silver chromate is 8.13×10^{-5} mole/lit. at 25°C. Calculate the solubility product.

3) How much extent was a metal chelate extracted when equal volume of the organic and aqueous phases were shaken together ? Given : Distribution ratio $(\partial) = 5$.

3. Answer **any two** of the following : **10**

1) Explain the term co-precipitation and post precipitation. Give atleast four point of distinguish between them.

2) Draw schematic diagram of single beam atomic absorption spectrophotometer and describe basic components involved in it.

3) Sketch schematic diagram of the apparatus used in GLC. Describe its components in brief.

4. a) What is the pH of the solution ? Give construction and working of the potentiometric pH meter. Give its mode of operation. **6**

OR

a) 1) Explain with suitable diagram premixed burner used in FES. **3**

2) Explain the factors affecting measurement in turbidimetry and nephelometry. **3**

b) Show by calculations which is more effective extraction of 20 ml aqueous solution containing 18 gm of solute with
 i) 20 ml organic solvent.
 ii) With 4 successive extractions with 5 ml solvent each.
   [Given : Distribution ratio = 10] **4**

OR

b) If the precipitate of Mg $(OH)_2$ is washed with 200 ml of water. Calculate how many grams of the precipitate lost during the washing operation.

Given = Kjp = 1.082×10^{-11} at 25°C

Molecular weight of Mg $(OH)_2 = 58$. **4**

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T.Y. B.Sc. Semester – III Examination, 2009
CHEMISTRY (Paper – V)
CH – 335: Industrial Chemistry
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B.: 1) **All** questions are **compulsory**.
      2) *Figures to the **right** indicate **full** marks.*
      3) *Draw **neat** diagram and flow sheets **wherever** necessary.*

1. Answer the following: **10**

    i) Explain the term "Conversion".

    ii) Write the chemical reactions involved in the manufacture of ammonia by Haber Bosch process.

    iii) What are "Mixed Fertilizers" ?

    iv) Write any two uses of bagasse.

    v) Define the term "Elastomers".

    vi) Define the term "Process Control".

    vii) Give two important uses of Sulphuric acid.

    viii) Urea is most popular Nitrogeneous fertilizer, why ?

    ix) Explain the term "Vinegar".

    x) What is a "latex" ?

2. A) Attempt **any two** of the following: **6**

    i) Explain the term unit operation and unit process with suitable examples.

    ii) Distinguish between vanadium pentoxide and platinised asbestos catalyst used in manufacture of sulphuric acid.

    iii) What are basic requirement for fermentation process ?

   B) Answer **any two** of the following: **4**

    i) Explain the term capital cost and production cost.

    ii) Sulphur trioxide (SO_3) is not absorbed in water. Explain why ?

    iii) What are qualities of good fertilizer ?

                                                                      P.T.O.

3. Answer **any two** of the following: **10**

   i) Describe the manufacture of single superphosphate with special reference to flow sheet and chemical reactions.

   ii) Describe the manufacture of ethyl alcohol from Molasses with special reference to coffee still.

   iii) Discuss with flow sheet the manufacture of SBR by cold process.

4. A) Describe with flow sheet and chemical reaction involved in manufacture of nitric acid from ammonia by Ostwald process. **6**

            OR

  A) Discuss the manufacture of refined sugar from raw sugar with flow sheet. Discuss one physical method for estimation of sugar.

  B) Give an account of basic operations involved in fermentation process. **4**

            OR

  B) Give synthesis and uses of

    1) Phenol formaldehyde resin

    2) PVC (polyvinyl chloride).

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T.Y. B.Sc. (Semester – III) Examination, 2009
CHEMISTRY (Paper – VI)
CH- 336 (A) : Nuclear Chemistry
(2004 Pattern)

Time: 2 Hours   Max. Marks: 40

Instructions : 1) **All** questions are **compulsory**.
                      2) *Figures to the* **right** *indicate* **full** *marks.*
                      3) **Draw** *the diagrams* **whenever** *necessary.*
                      4) **Use** *of log tables and calculator is* **allowed**.

1. Answer the following :   **10**

    a) Which of the following nucleus has a relatively stable nucleus ?
        A) Radium   B) Thorium   C) Polonium   D) Iron

    b) The isotone of $^{3}_{1}H$ is _____

        A) $^{2}_{1}H$ B) $^{4}_{2}He$ C) $^{3}_{2}He$ D) $^{13}_{6}C$

    c) Define separation factor.

    d) State the principle of chemical exchange method.

    e) The decay constant of a particular isotope is 0.0693 year $^{-1}$. What is the value of half life ?

    f) Define half life. What is the relation between half life and decay constant ?

    g) State the magic number of protons and neutrons in case of

        A) $^{210}_{84}Po$ B) $^{208}_{82}Pb$

    h) State two limitations of liquid drop model.

    i) Complete the following nuclear reaction $^{14}_{7}N + ^{1}_{0}n \rightarrow ---+ ^{1}_{1}H$.

    j) Define photonuclear reaction.

2. A) Attempt **any two** of the following : **6**

    a) Explain the separation of isotopes by gaseous diffusion method.

    b) Explain Bethe's notation. What are the different types of nuclear reaction ?

    c) Give classification of nuclides according to their mass number and atomic number.

  B) Answer **any two** of the following : **4**

    a) Calculate the binding energy of $^{209}_{83}\text{Bi}$.

    Given mass of proton $= 1.007825$ amu

         mass of neutron $= 1.008665$ amu

         mass of ^{209}Bi $= 208.980$ amu.

    b) What is reaction cross section ? Give its units.

    c) Define Nuclear isomerism and Isomeric transition.

3. Answer **any two** of the following : **10**

    a) Explain different types of radioactive decay processes with suitable examples.

    b) State and explain semi-empirical mass equation and explain the terms involved in it. State the applications of semi-empirical mass equation.

    c) What is compound nucleus ? Discuss the important feathers of compound nucleus theory.

4. A) Discuss the nuclear shell model and give its important feathers. **6**

        OR

  A) Explain the Electromagnetic method used for the separation of isotopes with suitable diagram. **6**

  B) What is Geiger-Nuttal's law ? Give its applications. **4**

        OR

  B) The initial activity of a sample containing radioactive carbon was 15.30 dis/min. Present activity of the sample is 5.10 dis/min. How old is the sample if the half life is 5730 years ? **4**

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[3617] – 320

CHEMISTRY (Paper – VI)
CH- 336 (B) : Polymer Chemistry
(2004 Pattern)

Time: 2 Hours
Max. Marks: 40

Instructions : 1) **All** questions are **compulsory**.
2) *Figures to the* **right** *indicate* **full** *marks.*
3) **Draw** *figures* **wherever** *necessary.*
4) **Use** *of log table/calculator is* **allowed**.

1. Answer the following : **10**
    i) Define the term -polymer.
    ii) Name any two initiators used in cationic polymerisation.
    iii) Draw the structures of the following monomers-
        a) Ethylene glycol
        b) Vinyl chloride
    iv) Write IUPAC name of $phSiEt_3$.
    v) Calculate the molecular weight of polybutadiene polymer whose D_p value is 1660.
    vi) Draw the structure of polystyrence polymer.
    vii) Choose the correct alternative in the following :
        Leo Backeland had invented.......(M-F. resin, P-F resin)
    viii) State whether the following statement is true or false-
        In polymer solution, saturation point is absent.
    ix) Name any two commonly used stabilizers.
    x) Give any two important applications of polyethylene terphthalate.

2. A) Explain the following (**any 3**) : **6**
        i) Fillers are often used for making plastic articles.
        ii) Nylon-66 is used for making fisherman's nets.
        iii) PVC polymer is gift to agricultural field.
        iv) Modern age is the age polymers.

    B) How will you distinguish between the following (**any two**) : **4**
        i) Plastics and synthetic fibres.
        ii) Natural and synthetic polymers.
        iii) Homopolymers and copolymers.

3. Answer **any two** of the following :   **10**

   i) Give a full account of pearl polymerization.

   ii) Discuss in brief viscometric method for determination of polymer molecular weight.

   iii) Write short note on-cure reactions.

4. A) Attempt **any two** of the following :   **6**

     i) Role of plasticizers during polymer processing.

     ii) Explain about the elasticity of solid polymeric substances.

     iii) A certain polymer sample contains the fractions A, B, C, D with their numbers and molecular weights as shown below :

       Fraction A - 250 molecules with molecular weight 10^5

       Fraction B - 300 molecules with molecular weight 10^6

       Fraction C - 350 molecules with molecular weight 10^4

       Fraction D - 150 molecules with molecular weight 10^7

   Calculate the number-average molecular weight ($\overline{M}_n$) for the polymer sample.

  B) Complete the following polymer reactions (**any 4**) :   **4**

i)   [structure] $\xrightarrow{H_2O}$?

ii) n HOOC-R-COOH + n HO-R-OH $\xrightarrow{\Delta}$?

iii) [structure] $\xrightarrow{mCPBA}$?

iv) [structure] $\xrightarrow[CH_3COONa]{(CH_3CO)_2O,}$?

v) n CH$_2$=CH(COOCH$_3$) $\xrightarrow{\Delta}$?

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[3617] – 320
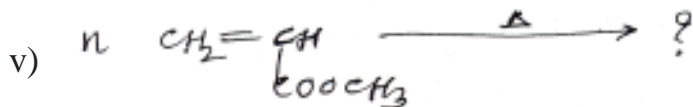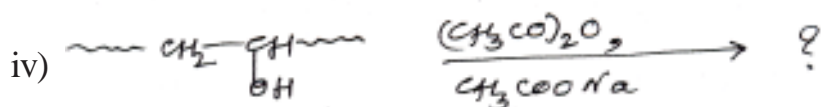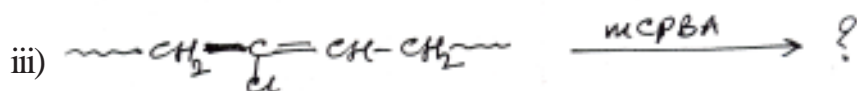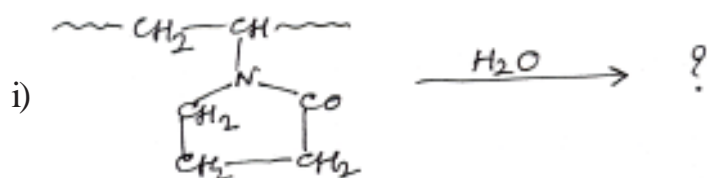
CHEMISTRY (Paper – VI)
CH- 336 (C) : Biochemistry
(2004 Pattern)

Time: 2 Hours   Max. Marks: 40

Instructions : i) **All** questions are **compulsory**.
            ii) Figures to the **right** indicate **full** marks.
            iii) **Neat** diagrams must be drawn **wherever** necessary.

1. Answer the following :   **10**
    i) Write the M.M. equation.
    ii) Name any two acidic amino acid.
    iii) Define the term peptide bond.
    iv) What is agonist ?
    v) Name any two reducing sugar.
    vi) Give the principle of technique dialysis.
    vii) Give any one example of enzyme oxidoreductase class.
    viii) What is zwitterion ?
    ix) Give the constituent of cell membrane.
    x) Define the term optimum temperature.

2. A) Attempt (**any two**) :   **6**
        i) Discuss the features of plant cell.
        ii) Explain the titration curve of amino acid.
        iii) What is nutrient ? Give it's significance with suitable example.

    B) Write the structure of following peptide (**any two**) :   **4**
        i) Val-Arg-Jle-Gly   ii) Trp-Pro-Tyr-Asp
        iii) Phe-Gly-Le-Lys

3. Answer the following (**any two**) :   **10**
    i) Describe the classification of hormones on the basis of structure.
    ii) What is biologically active peptide ? Explain with suitable example.
    iii) Describe the 3D structure of myoglobin.

4. A) Explain in detail the structure, composition and function of cell membrane.   **6**

                OR

    A) Describe the classification of amino acid on the basis of R group.

    B) Discuss the structure of eukaryotic cell.

                OR

    B) Give the following reaction :   **4**
        i) Adman's   ii) Dansyl chloride.

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CHEMISTRY (Paper – VI)
CH- 336 (D) : Environmental Chemistry
(2004 Pattern)

Time: 2 Hours   Max. Marks: 40

Instructions :   i) ***All*** questions are ***compulsory.***
                    ii) Figures to the ***right*** indicate ***full*** marks.
                    iii) ***Neat*** diagrams must be drawn ***wherever*** necessary.

1. Answer the following questions in short :   **10**
   i) What is the relationship between ppm and ppb ?
   ii) What is humin ?
   iii) What is temperory hardness of water ?
   iv) Define 'Sink'.
   v) Name the minor components of atmosphere.
   vi) Define 'Carcinogens'.
   vii) Define 'COD'.
   viii) Give two abnormal properties of water.
   ix) Define 'reducing smog'.
   x) Define 'primary pollutants'.

2. a) Attempt **any two** of the following :   **6**
   i) 'Acid rain' explain.
   ii) 'Microbially mediated reactions involving nitrogen transformation'. Explain.
   iii) 'Persistant pesticides' explain.

   b) Write short notes on (**any two**) :   **4**
   i) Stratification of water bodies.   ii) Radioactive pollution.
   iii) Pollution due to detergents.

3. Attempt **any two** of the following :   **10**
   i) Describe monitoring method for 'CO'.
   ii) Describe about Total hardness of water.
   iii) TC DD accident.

4. a) Discuss 'Thermal Pollution'.

   <div align="center">OR</div>

   Describe the method of analysis of dissolved oxygen.   **6**

   b) Write short note on (**any one**) :   **4**
   i) Composite sampling of water.   ii) Suspended particulate matter.
   iii) Sources of hydrocarbons.

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[3617] – 320

CHEMISTRY (Paper – VI)
CH- 336 (E) : Agriculture and Dairy Chemistry (Theory)
(2004 Pattern)

Time: 2 Hours   Max. Marks: 40

Instructions : 1) **All** questions are **compulsory**.
                  2) *Figures to the **right** indicate **full** marks.*
                  3) ***Draw** flow sheet/diagram **wherever** necessary.*

1. Answer the following :   **10**

   i) What do you understand by

      a) Soil pH   b) Soil water.

   ii) Define herbicides and give two examples.

   iii) What is calcareous soil ?

   iv) Differentiate between surface soil and sub soil.

   v) Draw flow sheet diagram of "vermicomposting" (outdoor).

   vi) Define Pasteurization of milk.

   vii) Why is it necessary to filter preheated milk ?

   viii) What is 'Solid Not Fat' Value ?

   ix) Give nutritive value and uses of milk proteins albumin.

   x) Give flow sheet diagram of manufacture of butter.

2. A) Answer **any three** of the following :   **6**

      i) Give advantages and disadvantages of green manuring.

      ii) What do you understand by sewage irrigation ?

      iii) Explain the growth of microorganisms in milk.

      iv) Define casein. Give its classification and importance.

   B) Attempt **any two** of the following :   **4**

      i) How soil temperature affects the growth of plants ?

      ii) What is the mode of action of sulphur fungicide ?

      iii) Comment on acidity and pH of milk.

      iv) Explain the term 'homogenization' of milk.

3. A) Write an essay on 'Insecticides'. **5**

OR

   i) State the factors controlling soil reactions.

   ii) Explain importance of agriculture chemistry.

  B) Write a note on milk vitamins. **5**

OR

Define Market milk. State constituents of milk. Explain the factors affecting composition of milk.

4. A) Attempt **any three** of the following : **6**

   i) Differentiate between attractants and repellents.

   ii) Define fertilizers and classify them.

   iii) Define Preservation. What are most commonly used chemicals for preserving milk ?

   iv) Classify cream. Give its food and nutritive value.

  B) Attempt **any two** of the following : **4**

   i) What is soil testing ? Give its importance.

   ii) Differentiate between broadcasting and placement.

   iii) Give advantages and disadvantages of sterlised milk.

   iv) How do you test the presence of (a) sucrose b) starch in the milk ?

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T.Y. B.Sc. (Semester – III) Examination, 2009
BOTANY (Paper – I) (2004 Pattern)
BO-331 : Biology of Lower Cryptogams

Time : 2 Hours   Max. Marks : 40

Instructions *: 1)* ***All*** *questions are* ***compulsory****.*
                      2) ***Draw*** *neat labelled diagrams* ***wherever*** *necessary.*
                      3) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Attempt the following.   **10**
   a) Give any two examples of unbranched filamentous algae.
   b) Define Oogamy.
   c) Enlist the pigments found in Cyanophyta.
   d) What is a receptacle ?
   e) What is an acervulus ?
   f) Define obligate parasite.
   g) Give two examples of algae used in medicine.
   h) Which are the male and female sex organs in Chara ?
   i) What is basidiocarp ?
   j) What is macrocyclic rust ?

2. Attempt **any two** of the following.   **10**
   a) Give importance of Algae in Industry.
   b) Describe the thallus structure of Batrachospermum.
   c) Describe the telial and basidial stage in Puccinia graminis.

3. Write notes on **(any two)** :   **10**
   a) Contribution of Dr. K.C.Mehta.
   b) Diagrammatic representation of life cycle of Chara.
   c) Sexual fruiting bodies found in Fungi.

4. Describe the asexual reproduction in Penicillium and add a note on its economic
   importance.   **10**

                              OR

4. Describe in detail sexual reproduction in Sargassum.   **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
BOTANY (Paper – II) (2004 Pattern)
BO – 332 : Biology of Higher Cryptogams

Time : 2 Hours   Max. Marks : 40

*Instructions :1) **All** questions are **compulsory**.*
*2) **Neat** labelled diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*

1. Answer the following :   **10**

   a) Give any two examples of class Hepaticopsida.

   b) What is protostele ?

   c) Give any two characters of pteridophyta.

   d) What type of rhizoids are found in Marchantia ?

   e) Sketch and label the sporocarp of Marsilea.

   f) What is Heterospory ?

   g) Give two points of differences between the sporophyte of Anthoceros and Funaria.

   h) How many teeth are there in operculum of capsule of Funaria ?

   i) Which type of leaves are present in Lycopodium ?

   j) What is Apospory ?

2. Attempt **any two** of the following :   **10**

   a) Describe the external structure of gametophyte of Marchantia.

   b) With the help of labelled diagram explain the internal structure of sporophyte of Anthoceros.

   c) Describe the structure of sporocarp of Marsilea with the help of horizontal longitudinal section.

3. Write short notes (**any two**) :   **10**

   a) Protonema of <u>Funaria</u>.

   b) Synangium of <u>Psilotum</u>.

   c) L.S. of <u>Lycopodium</u> strobilus.

4. With the help of labelled diagram explain the structure of capsule of <u>Funaria</u>.   **10**

                 OR

What is alternation of generation ? Explain it with the help of diagrammatic representation of any pteridophyte plant studied by you.   **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
BOTANY (Paper – III) (2004 Pattern)
BO – 333 : Biology of Seed Plants – I
(Angiosperms and Environmental Biology)

Time : 2 Hours   Max. Marks : 40

*Instructions : 1) **All** questions are **compulsory**.*
               *2) Draw neat labelled diagrams **wherever** necessary.*
               *3) Figures to the **right** indicate **full** marks.*

1. Attempt the following :   **10**
   a) Give an example of natural system of classification.
   b) State the era of Caytoniales.
   c) Give one assumption of Takhtajan's system of classification.
   d) What is the type of fruit in family Magnoliaceae ?
   e) What is type of inflorescence in family Asteraceae ?
   f) What is EIA ?
   g) Define the conservation.
   h) Give one role of national organization in environment.
   i) What is endemism ?
   j) Define air pollution.

2. Answer **any two** of the following :   **10**
   a) Describe continental drift.
   b) Give the renewable energy sources.
   c) Give the economic importance of family Meliaceae.

3. Write short notes on (**any two**) :   **10**
   a) Gnetalean theory of origin of angiosperm.
   b) Flower of <u>Canna</u> <u>indica</u>.
   c) Environmental Protection Act.

4. Give an account of Engler and Prantl's system of classification. Give merits and demerits.   **10**

             OR

Describe the various sources of water pollution. Add note on its control measures.

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T.Y. B.Sc. (Semester – III) Examination, 2009
BOTANY (Paper – IV) (2004 Pattern)
BO-334 : Cell Biology and Biometrics

Time : 2 Hours   Max. Marks : 40

Instructions: *1)* ***All*** *questions are* ***compulsory.***
           2) Draw neat labelled diagrams ***wherever*** *necessary.*
           3) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Attempt the following :   **10**

   a) Define sample.
   b) What is pinocytosis ?
   c) Give a formula to calculate median.
   d) What is nucleoplasmic index ?
   e) Mention any two functions of chloroplast.
   f) Define population.
   g) What is mitosis ?
   h) Define range.
   i) What is positive correlation ?
   j) State cell theory.

2. Answer **any two** of the following :   **10**
   a) What is endoplasmic reticulum ? Describe rough endoplasmic reticulum.
   b) Describe ultrastructure of golgi body.
   c) Give applications of probability.

3. Write notes on **any two** of following :   **10**

   a) Normal distribution

   b) Chi-square test

   c) Ribosome.

4. Describe the structural organization of normal metaphase chromosome.   **10**
                    OR
   What is correlation ? Describe types of correlation.

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T.Y. B.Sc. (Semester – III) Examination, 2009
BOTANY (Paper – V) (2004 Pattern)
BO – 335: Microbiology and Plant Pathology

Time : 2 Hours   Max. Marks : 40

***Instructions : i) All** questions are **compulsory**.*
               *ii) Draw neat labelled diagrams **wherever** necessary.*
               *iii) Figures to the **right** indicate **full** marks.*

1. Attempt the following :   **10**
   a) What is culture of microorganisms ?
   b) Enlist the modes of pathogen spread.
   c) Give any two features of fungi.
   d) What do you mean by bio control ?
   e) Name any two diseases caused by mycoplasma to plants.
   f) Write any two characteristic features of algae.
   g) Give two examples of physical defence shown by plants against pathogen.
   h) What is food processing ?
   i) Define IPM system.
   j) Write any two examples of epidemics programme used for disease diagnosis.

2. Answer **any two** of the following :   **10**
   a) Write about ultrastructure of bacterium.
   b) Describe role of microorganisms in phosphate solubilization.
   c) Explain chemical aspect of plant disease management.

3. Write notes on (**any two**) :   **10**
   a) Nematodes as plant pathogen.
   b) Microorganisms and milk products.
   c) Disease cycle.

4. Define microbiology. Explain basic principles of staining and add a note on
   significance of staining.   **10**
   OR
   Give an account of black stem rust of wheat with reference to causal organism,
   symptoms and control measures.   **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
BOTANY (Paper – VI) (2004 Pattern)
BO-336 : Botanical Techniques and Computer Applications

Time : 2 Hours   Max. Marks : 40

Instructions : 1) **All** *questions are* **compulsory**.
2) **Draw** *neat & labelled diagrams* **wherever** *necessary.*
3) Figures to the **right** *indicate* **full** *marks.*

1. Attempt the following :   **10**
   a) Define resolving power of microscope.
   b) What is mean by operating system ?
   c) Define sedimentation coefficient.
   d) What are icons ?
   e) Mention the utility of condenser in light microscope.
   f) What is pH ?
   g) Give any two uses of Microsoft Excel.
   h) What is numerical aperture ?
   i) Define Taskbar.
   j) What is spreadsheet ?

2. Attempt **any two** of the following :   **10**
   a) What is Microsoft Power Point ? Give its applications.
   b) Describe Tilak air sampler. Add a note on its applications.
   c) What is chromatography ? Give principle and applications of TLC.

3. Write short notes on **any two** of the following :   **10**
   a) Acetolysis
   b) Internet
   c) Chart wizard

4. Describe the principle and working of spectrophotometer. Add a note on its
   applications.   **10**

                     OR

Explain the basic structure of computer with suitable diagram.

_____   *B/II/09/1235*

T.Y. B.Sc. (Semester – III) Examination, 2009
ZOOLOGY (Paper – I)
ZO – 331 : Animal Systematics and Diversity
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** *questions are* **compulsory**.
        2) **Neat** *labelled diagrams must be drawn* **wherever** *necessary.*
        3) *Figures to the* **right** *indicate* **full** *marks.*

1. Attempt the following :   **10**

    1) State the function of digestive gland in <u>Pila</u>.

    2) Mention any two important features of Echinoderms.

    3) Give example of fruit eating beak.

    4) Give any two examples of aquatic arthropods.

    5) State the food of <u>Pila</u>.

    6) What are perching feet ?

    7) Define acrodont dentition.

    8) State any two general features of Aves.

    9) Give any two examples of aquatic mammals.

    10) What is Corallum ?

2. Attempt **any two** of the following :   **10**

    i) Describe sexual dimorphism in <u>calotes</u>.

    ii) Describe general features of Hemichordata.

    iii) Describe Neoteny in Amphibians.

P.T.O.

3. Write notes on **any two** of the following :   **10**

   a) Osphradium in Pila.

   b) Foot in Mollusca.

   c) General features of mammals.

   d) General characters of Arthropoda.

4. Describe nervous system of Pila.   **10**

               OR

4. Describe dorsal and ventral view of brain of Calotes.

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T.Y. B.Sc. (Semester–III) Examination, 2009
ZOOLOGY (Paper–II)
ZO – 332 : Histology of Mammals
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

*N.B. : 1) **All** questions are **compulsory**.*
*2) **Neat** labelled diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*

1. Attempt the following :   **10**

    1) What is fixation of tissue ?

    2) What is connective tissue proper ?

    3) Define resolving power.

    4) What is hepatic lobule ?

    5) Mention significance of dehydration process.

    6) What is respiratory epithelium ?

    7) What is merocrine secretion ?

    8) Mention tissue layers of an artery.

    9) Name types of lingual papillae.

    10) What is seminiferous tubule ?

2. Attempt **any two** of the following :   **10**

    i) Sketch and label T.S. through trachea.
    ii) Describe histological structure of Juxtaglomerular complex.
    iii) What is clearing agent ? Describe merits and demerits of any four clearing agents.

3. Write notes on **any two** :   **10**

   a) Taste bud

   b) V.S. through tooth

   c) Peyer's patch

   d) Graafian follicle.

4. Describe histological structure of skin.   **10**

                         OR

4. Describe histological structure of stomach.   **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
ZOOLOGY (Paper – III)
ZO-333 : Environmental Biology and Toxicology (2004 Pattern)

Time : 2 Hours

Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.

2) *Neat labelled diagrams must be drawn* **wherever** *necessary*.

3) *Figures to the* **right** *indicate* **full** *marks*.

1. Attempt the following : **10**

1) Define environment.

2) In which zone of atmosphere ozone is present ?

3) What is smog ?

4) When the Environmental Protection Act (EPA) was introduced ?

5) Define concentration factor.

6) Name any two compartments of environment.

7) Define natural resource.

8) What is the cause of Minamata disease ?

9) Define endangered species.

10) What are food additives ?

P.T.O.

2. Attempt **any two** of the following : **10**

   i) Describe types of forests with respect to global location and name important producers in there.

   ii) Explain the effect of age on the toxicity of a toxicant.

   iii) What is environmental monitoring ? State requirements for effective environmental monitoring.

3. Write notes on **any two** of the following : **10**

   a) Adverse effects of sewage pollution.

   b) Components of an ecosystem.

   c) Significance of wild life conservation.

   d) Role of Television in environmental education.

4. What is toxicology ? Explain scope of any three divisions of toxicology. **10**

                    OR

4. Give an account of causes and consequences of global warming. **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
ZOOLOGY (Paper – IV)
ZO-334 (a) : General Entomology
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : i) **All** questions are **compulsory**.
             ii) Neat labelled diagrams must be drawn **wherever** necessary.
             iii) Figures to the **right** indicate **full** marks.

1. Attempt the following :   **10**
    1) What is a hormone ?
    2) What is an elytra ?
    3) What are peculiarities of Fossorial type of leg ?
    4) Name any two social insects.
    5) What is obtact pupa ?
    6) Name any two hemipterian insects.
    7) Name the insect with sponging type of mouthparts.
    8) Define entomology.
    9) Mention any two characters of lepidoptera.
   10) Name any one bioluminescent insect.

2. Attempt **any two** of the following :   **10**
    i) Explain nest building behaviour in wasps.
    ii) Describe light producing organs in insects.
    iii) Describe the characters and significance of order coleoptera.

3. Write notes on **any two** of the following :   **10**
    a) Abdominal appendages.
    b) Raptorial and saltatorial type of legs.
    c) Types of larvae in insects.
    d) Role of pheromones in pest control.

4. Describe sound producing organ and sound producing mechanism in cicada.   **10**
                    OR
4. Describe siphoning type of mouthparts in insects and compare them with piercing
   and sucking type.   **10**

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P.T.O.

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T.Y. B.Sc. (Semester – III) Examination, 2009
ZOOLOGY (Paper – IV)
ZO-334 (b) : General Pathology

Time : 2 Hours   Max. Marks : 40

*N.B. : 1) **All** questions are **compulsory**.*
*2) **Neat** labelled diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*

1. Attempt the following :   **10**
   1) Define embolism.
   2) What is silicosis ?
   3) Define shock.
   4) What is amyloid degeneration ?
   5) What is posthepatic jaundice ?
   6) What is metastatic calcification ?
   7) Define auto immunity.
   8) Define gangrene.
   9) What is biopsy ?
   10) What is oedema ?

2. Attempt **any two** of the following :   **10**
   i) Explain the importance of C.S.F. examination.
   ii) Explain causes and significance of occupational diseases.
   iii) Explain the importance of blood groups.

3. Write notes on **any two** of the following :   **10**
   a) Cloudy degeneration.
   b) Nuclear changes in necrosis.
   c) Effects and fate of thrombosis.
   d) Characteristics of malignant tumour.

4. What is inflammation ? Explain vascular changes in the process of inflammation.   **10**

OR

4. Explain the process of repair. Add a note on types of repair.   **10**

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[3617] – 330

T.Y. B.Sc. (Semester – III) Examination, 2009
ZOOLOGY (Paper – IV)
ZO-334 (c) : Dairy Science

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* **All** *questions are* **compulsory**.
         2) Neat labelled diagrams must be drawn **wherever** *necessary.*
         3) Figures to the **right** *indicate* **full** *marks.*

1. Attempt the following :   **10**
   1) Name any two exotic cattle breeds.
   2) Define post natal care.
   3) What is grooming ?
   4) What is COB ?
   5) Define lactation.
   6) What is parturation ?
   7) Define paneer.
   8) What is adulteration ?
   9) Define milk.
   10) Define weaning.

2. Attempt **any two** of the following :   **10**
    i) Explain loose housing farm.
    ii) Explain the process and significance of pasteurization of milk.
    iii) Describe the process of manufacture of ghee.

3. Write notes on **any two** of the following :   **10**
    a) Packaging of milk.
    b) Gir breed.
    c) Artificial insemination.
    d) Chemical preservatives of milk.

4. Explain the structure of mammary gland and add a note on physico-chemical and
   nutritional properties of milk.   **10**

                     OR

4. Explain the manufacture, storage and nutritive values of ice-cream. **10**

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T.Y. B.Sc. (Semester–III) Examination, 2009
ZOOLOGY (Paper–V)
ZO : 335 - Cell Biology
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : i) **All** *questions are* **compulsory**.

ii) **Neat** *labelled diagrams must be drawn* **wherever** *necessary.*

iii) *Figures to the* **right** *indicate* **full** *marks.*

1. Attempt the following :   **10**

   1) What is a eukaryotic cell ?

   2) Define active transport.

   3) What are peroxisomes ?

   4) Mention significance of microvilli.

   5) What are somatic mutations ?

   6) Why mitochondria are known as power house of cell ?

   7) What is the function of Nucleolus ?

   8) What is the function of endoplasmic reticulum ?

   9) Give the importance of spindle fibres.

   10) What is Cell death ?

2. Attempt **any two** of the following :   **10**

   i) Distinguish between meiosis and mitosis.

   ii) Describe structure and function of lysosome.

   iii) Describe ultra structure of centriole.

3. Write short notes on **any two** of the following : **10**

   a) Topological relationships

   b) Necrosis

   c) Ultra structure of Nucleus

   d) Pinocytosis.

4. Describe the structure and chemical composition of fluid mosaic model of plasma-membrane. **10**

                OR

4. What is cancer ? Describe the causes of cancer. **10**

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T.Y. B.Sc. (Semester–III) Examination, 2009
ZOOLOGY (Paper–VI)
ZO – 336 : Biological Chemistry and Biotechniques
(2004 Pattern)

Time : 2 Hours　　　　　　　　　　　　　　　　　　Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
　　　　2) **Neat** labelled diagrams must be drawn **wherever** necessary.
　　　　3) Figures to the **right** indicate **full** marks.

1. Attempt the following :　　　　　　　　　　　　　　　　**10**

　　1) Define pH.

　　2) What is a glycosidic bond ?

　　3) Name any two fibrous proteins.

　　4) What are Waxes ?

　　5) State two functions of sodium.

　　6) What is C-terminal ?

　　7) What are regulatory enzymes ?

　　8) What are biomolecules ?

　　9) Name any two structural polysaccharides.

　10) What is Enzyme Inhibition ?

2. Attempt **any two** of the following :　　　　　　　　　　**10**

　　i) How does substrate concentration affect enzyme activity ?

　　ii) What are monosaccharides ? State their biological significances.

　　iii) Explain the principle and applications of paper chromatography.

3. Write notes on **any two** :   **10**

   a) Structure of water

   b) Obesity

   c) Mutarotation

   d) Isoenzymes.

4. What are amino acids ? Classify protein forming amino acids with one example of
   each type.   **10**

                      OR

4. What are Vitamins ? State the sources, functions and significances of Vitamin C
   and Vitamin D.   **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
GEOLOGY (Paper – I)
GL : 331 – Indian Stratigraphy – I
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions : 1) *All questions are compulsory.*
                 2) *All questions carry equal marks.*
                 3) *Black figures to the right indicate full marks.*
                 4) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following **2/3** lines :
   a) Define and name tectonic elements/divisions of India.
   b) Name the different Precambrian orogenic belts of India.
   c) Define Gondites.
   d) Name the districts of Bihar and Orissa where Archeans are found.
   e) Name the important lithostratigraphic groups of Central India.
   f) Name the four upper formations of sausar group.
   g) Name the three regional trends that meet at Bhandara triangle.
   h) Name lithological types of Aravalli super group.
   i) Give formations of Cuddapah Super Group in chronological order.
   j) Give the lithology of Salkhala Group.   **10**

2. Write notes on (**any two**) :
   a) Igneous activity in Cuddapah Super Group.
   b) Clospet granite.
   c) Peninsular Gneissic Complex.   **10**

3. Write notes on (**any two**) :
   a) Lower Vindhyans.
   b) Stratigraphic succession of Delhi Super Group.
   c) Khondalites.   **10**

4. Give the geogrphic distribution, stratigraphic succession, lithology and economics of Dharwar Super Group
                    OR
   Sakoli Group.   **10**

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T.Y. B.Sc. (Semester–III) Examination, 2009
GEOLOGY (Paper–II)
GL – 332 : PETROLOGY – I
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions. *:1)* ***All*** *questions are* ***compulsory.***

   2) ***All*** *questions carry* ***equal*** *marks.*

   3) ***Black*** *figures to the* ***right*** *indicate* ***full*** *marks.*

   4) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

1. Answer the following in **2/3** lines :

   a) Describe granulose structure.

   b) What is meant by "Palimpsest structure" ?

   c) Define thermal diffusion.

   d) What are volatile constituents ?

   e) Define Magmatic contamination

   f) Define Plutonic metamorphism.

   g) What are Slaty Cleavages ?

   h) Which rocks give rise to dolomites ? When ?

   i) What is meant by greissening ?

   j) Define crystal fractionation.   **10**

2. Write notes on (**any two**) :

   a) Crystal fractionation of Forsterite - Fayalite system.

   b) Assimilation without melting.

   c) Diagnostic structures of thermally metamorphosed rocks.   **10**

3. Write notes on (**any two**) :

   a) Lime metasomatism.

   b) Regional metamorphism of ultrabasic rocks.

   c) Tourmalinisation. **10**

4. a) Explain Pneumatolytic metasomatism and give its types.

   b) Discuss thermal metamorphism of acid igneous rocks.

                        OR

4. Describe the structures produced during regional metamorphism. **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
GEOLOGY (Paper – III)
GL – 333 : Structural Geology
(2004 Pattern)

Time: 2 Hours   Total Marks: 40

Instructions : 1) **All** questions are **compulsory**.
　　　　　　　　2) **All** questions carry **equal** marks.
　　　　　　　　3) Black figures to the **right** indicate **full** marks.
　　　　　　　　4) Neat diagrams must be drawn **wherever** necessary.

1. Answer the following in **2/3** lines :   **10**

　　a) Cleavage banding.

　　b) Definition of structural geology.

　　c) Granulation cleavage.

　　d) Elastic limit of rocks.

　　e) Define plastic deformation in rocks.

　　f) Mention the causes of folding.

　　g) Couple and torsion.

　　h) Strike slip fault (figure)

　　i) Definition of underthrust.

　　j) Lithostatic pressure.

2. Write notes on (**any two**) :   **10**

　　i) Intergranular and intragranular movements.

　　ii) Geometry and formation of a salt dome.

　　iii) Brittle and ductile behaviour of rocks

3. Answer the following (**any two**) : **10**

   i) Shear fractures

   ii) Types of faults in relation to net slip

   iii) Thrust faults.

4. What is meant by the term schistosity ? Describe in detail, how it is used in delineating the plunge of fold axis. **10**

<div align="center">OR</div>

4. Explain the stress-strain diagram and its implications in structural geology. **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
GEOLOGY (Paper – IV)
GL – 334 : Economic Geology
(2004 Pattern)

Time : 2 Hours   Total Marks : 40

Instructions : *1)* **All** *questions are* **compulsory**.
                      2) **All** *questions carry* **equal** *marks.*
                      3) Black figures to the **right** *indicate full marks.*
                      4) Neat diagrams must be drawn **wherever** *necessary.*

1. Define/ explain/answer the following in **2/3** lines :   **10**

   a) Define industrial minerals.

   b) Give two examples of late magmatic deposits.

   c) Overburden.

   d) Give two examples of evaporation deposits.

   e) What are Gossans ?

   f) Eluvial deposits.

   g) What are target rings of mineral distribution ?

   h) Gangue minerals.

   i) False Gossans.

   j) Hypothermal deposits.

2. Answer the following (**any two**) :   **10**

   i) Types of openings in rocks (any two).

   ii) Wall rock alterations.

   iii) Early magmatic concentration deposits.

                                                                                                    P.T.O.

3. Write short notes (**any two**) :   **10**

   i) Stages of prospecting.

   ii) Classification of metalliferous deposits.

   iii) Principles involved in mechanical concentration.

4. Explain, in detail, geobotanical prospecting.   **10**

                          OR

4. Describe, in detail, the principles, instruments and field methods in gravity prospecting.

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T.Y. B.Sc. (Semester–III) Examination, 2009
GEOLOGY (Paper–V)
GL – 335 : Environmental Geology
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions. *:1)* ***All*** *questions are* ***compulsory****.*

2) ***All*** *questions carry* ***equal*** *marks.*

3) ***Black*** *figures to the* ***right*** *indicate* ***full*** *marks.*

4) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

1. Answer the following in **2/3** lines :   **10**

   a) Enumerate various types of water pollution.

   b) Define cloud burst.

   c) What is greenhouse effect ?

   d) What is acid rain ?

   e) What is evapo transpiration ?

   f) Mention some important geological hazards.

   g) Define biogeochemical cycle.

   h) Name any one agency in India that undertakes disaster management.

   i) Define the term avalanche.

   j) Enumerate different causes of flood.

2. Answer the following (**any two**) :   **10**

   a) What is desertification ? Give the causes.

   b) Write an account on search and rescue operation during disaster.

   c) How can the risk of coastal erosion be minimized ?

3. Write notes (**any two**) : **10**

   a) Forecasting of floods

   b) Hazardous effects of volcanic eruptions

   c) Various relief and rehabilitation measures taken after a major earthquake.

4. What are safety measures ? Describe their utility in disasters caused by

   Mass-movement. **10**

   OR

4. What are landslides ? Describe the types of landslides. Comment on identification
   of landslide zone. **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
GEOLOGY (Paper – VI)
GL 336 : Field Geology, Geomorphology and Engineering Geology
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory***.
2) ***All*** *questions carry* ***equal*** *marks.*
3) Black figures to the ***right*** *indicate* ***full*** *marks.*
4) Neat diagrams must be drawn ***wherever*** *necessary.*

1. Answer the following in **2/3** lines :   **10**

   a) Explain the term spill-way.

   b) Give any two uses of field geology.

   c) Define field correlation.

   d) Explain the term inselberg.

   e) What is soil-creep ?

   f) What are ox-bow lakes ?

   g) Name any two gravity dams in India with location.

   h) State the characters of building stone.

   i) Define index fossil.

   j) What are Mesa and Butte ?

2. Answer **any two** of the following :   **10**

   a) What is the role of ground water in tunnelling ?

   b) Describe the compressive strength of rock.

   c) Describe any two erosional and two depositional features formed due to river action.

P.T.O.

3. Write notes on **any two** of the following : **10**

   a) Tensile strength of rock.

   b) Significance of Trellis and Annular drainage pattern.

   c) Railway ballast.

4. Define geomorphology. Explain the role of lithology in landscape/landform development. **10**

                    OR

4. What are the essential geo technical investigations carried out while selecting a damsite ? Add a note on gravity dam. **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
STATISTICS (Principal)
(Paper – I) ST – 331 : Distribution Theory – I
(2004 Pattern)

Time: 2 Hours   Max. Marks: 40

Instructions : 1) ***All*** *questions are* ***compulsory.***
2) *Figures to the* ***right*** *indicate* ***full*** *marks.*
3) ***Use*** *of calculator and statistical tables is* ***allowed.***
4) *Symbols and abbreviations have their* ***usual*** *meanings.*

1. Attempt **each** of the following :   **(1 each)**

   a) Choose the correct alternative in **each** of the following :

      i) If $X \sim W(\sqrt{2}, \beta)$, then the mean of X is

         A) $\dfrac{1}{\sqrt{2}}\left|\dfrac{1}{\beta}+1\right.$ B) $\sqrt{2}\left|\dfrac{1}{\beta}+1\right.$ C) $\dfrac{1}{\sqrt{2}}\left|\beta+1\right.$ D) $\sqrt{2}\left|\beta+1\right.$

      ii) If $(X_1, X_2, X_3) \sim MD\,(n\,;\,p_1, p_2, p_3)$, then covariance of X_2 and X_3 is

         A) $n\,p_2\,p_3$ B) $n\,p_1\,p_2\,p_3$ C) $-\,n\,p_2\,p_3$ D) $-\,n\,p_1\,p_3$

      iii) If X is a continuous random variable, then distribution function $F_X(x)$ follows.

         A) W (0, 1) distribution   B) Gamma distribution

         C) N (0, 1) distribution   D) U (0, 1) distribution

      iv) The distribution of largest order statistic $X_{(n)}$ is

         A) $n\left[F(x)\right]^{n-1}$ B) $n\left[F(x)\right]^{n-1}f(x)$

         C) $n\left[1-F(x)\right]^{n-1}$ D) $n\left[1-F(x)\right]^{n-1}f(x)$

P.T.O.

b) State whether **each** of the following statement is **true** or **false** :   **(1each)**

   i) If $(X_1, X_2, X_3) \sim MD\ (20; 0.3, 0.2, 0.5)$, then the marginal distribution of X_2 is B(20, 0.5).

   ii) If $X \sim U(a, b)$, then $\mu'_2 = \dfrac{(b-a)^2}{12}$.

c) i) State weak law of large numbers (WLLN)   **(1 each)**

   ii) Give one real life situation where Weibull distribution is used.

d) i) Define convergence in probability.   **(1 each)**

   ii) State Chebyshev's theorem.

2. Attempt **any two** of the following :   **(5 each)**

   a) Let X and Y be two independent random variables each having standard uniform distribution. Obtain the distribution of $U = X/Y$.

   b) Let $X \sim W(\alpha, \beta)$. Obtain expression for variance of the distribution of X.

   c) Let $(X_1, X_2, ...,X_k) \sim MD\ (n; p_1, p_2, ..., p_k)$. State the MGF of $(X_1, X_2, ...,X_k)$ and hence find mean and variance of X_2.

3. Attempt **any two** of the following :

   a) State and prove Chebyshev's inequality for continuous random variable.   **5**

   b) i) The probability that the light bulbs of a certain kind of slide projector will last fewer than 50 hours of continuous use is 0.20. The probability that it will last any where from 50 to 90 hours of continuous use is 0.55, and it will last more than 90 hours of continuous use is 0.25. Find the probability that among 10 such bulbs, two will last fewer than 50 hours, six will last anywhere from 50 to 90 hours and two will last more than 90 hours.   **3**

   ii) Suppose that the lifetime (in hours) of a certain kind of an emergency backup battery is a random variable X having the Weibull distribution with $\alpha = 10$ and $\beta = 0.4$. Find the probability that such a battery will last more than 300 hours.   **2**

c) i) A continuous random variable X has probability density function given by

$$f(x) = e^{-x} , x > 0$$
$$= 0 \quad , \text{otherwise}$$

Obtain an upper bound for $P(|X - E(X)| > 2)$ using Chebyshev's inequality. Also find its actual value. **3**

ii) Let $Y \sim B\left(400, \dfrac{1}{5}\right)$. Compute an approximate value of P[Y>100]. **2**

4. Attempt **any one** of the following :

a) i) State and prove central limit theorem for independent and identically distributed random variables using moment generating function. **7**

ii) Let $X_{(1)}, X_{(2)}, X_{(3)}, X_{(4)}$ be the order statistics corresponding to a random sample of size 4 from U(0, 1) distribution.

Find $P\left(\dfrac{1}{2} < X_{(3)} < \dfrac{2}{3}\right)$. **3**

b) i) Let $X_{(1)}, X_{(2)},..., X_{(n)}$ be the order statistics corresponding to a random sample $X_1, X_2,..., X_n$ of size n from a continuous distribution with p.d.f. f(x, θ) and distribution function $F_X(x)$. Obtain probability density function of sample median (assume that n is an odd number) **6**

ii) Let $X \sim U(a, b)$. Obtain MGF of X and the expression for r^{th} order raw moment. **4**

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T.Y. B.Sc. (Semester–III) Examination, 2009
STATISTICS (Principal) (Paper–II)
ST–332 : Theory of Estimation (2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions *: i)* ***All*** *questions are* ***compulsory****.*

        ii) Figures to the ***right*** *indicate* ***full*** *marks.*

        iii) ***Use*** *of calculator and statistical tables is* ***allowed****.*

        iv) Symbols and abbreviations have their ***usual meanings****.*

1. a) In **each** of the following cases, choose the correct alternative :

   i) If $X_1, X_2, ..., X_n$ is a random sample from U $(0, \theta)$ then maximum likelihood estimator (MLE) of θ is

     a) $X_{(n)}$ b) $X_{(1)}$ c) $\overline{X}$ d) $X_{(n)} - X_{(1)}$

   ii) Let X ~ N (μ, σ^2) where μ is known. Then the Fisher information function $I(\sigma^2)$ is

     a) $\dfrac{2}{\sigma^2}$ b) $\dfrac{1}{2\sigma^4}$ c) $\dfrac{2}{\sigma^4}$ d) $\dfrac{4}{\sigma^4}$

   iii) Let X_1 and X_2 be a random sample (r.s.) from N $(0, \sigma^2)$ then sufficient statistic for σ^2 is

     a) $\dfrac{X_1^2 + X_2^2}{2}$ b) $\dfrac{X_1 + X_2}{2}$ c) $\dfrac{X_1^2 + X_2^2}{4}$ d) $\dfrac{(X_1 + X_2)^2}{4}$

   iv) Let X_1 and X_2 be a random sample from p.d.f. of X with E (X) = θ and var (X) = σ^2. Which of the following is not an unbiased estimator of θ ?

     a) $\dfrac{X_1 + 2X_2}{3}$ b) $\dfrac{2X_1 + X_2}{3}$ c) $\dfrac{X_1 + X_2}{4}$ d) $\dfrac{X_1 + X_2}{2}$

1 each

P.T.O.

b) In **each** of the following cases, state whether the given statement is **true** or **false** :

   i) Property of unbiasedness is invariant under linear transformation.

   ii) An estimator is consistent of its bias tends to zero as $n \to \infty$. **(1 each)**

c) i) Define Fisher information function.

   ii) State any two properties of MLE. **(1 each)**

d) Explain the following terms with suitable illustration.

   i) Relative efficiency

   ii) Parametric space. **(1 each)**

2. Attempt **any two** of the following :

  a) Define UNVUE of a parameter. Show that UMVUE is unique when it exists.

  b) If $X_1, X_2, ... X_n$ is a random sample from p.d.f.

    $f(x, \theta) = 1 ; \theta < x < \theta + 1$

        $= 0$; otherwise.

    Show that sample mean $\overline{X}$ is an unbiased and consistent estimator of $\theta + \dfrac{1}{2}$.

  c) Let $X_1, X_2, ... X_n$ be a r.s. from $N(\mu, \sigma^2)$. Show that $s^2 = \dfrac{\sum\limits_{i-1}^{n} (X_i - \overline{X})^2}{n-1}$ is an

    unbiased estimator of σ^2. **(5 each)**

3. Attempt **any two** of the following :

  a) Find Fisher information function $I(\alpha)$ for $G(\alpha, \lambda)$ distribution where λ is known.

  b) A r.v. X has p.d.f. given by $f(x) = x^{\alpha}(\alpha + 1); 0 < x < 1, \alpha > -1$

                        $= 0$; otherwise.

    A r.s. 0.2, 0.4, 0.8, 0.5, 0.7, 0.9, 0.8, 0.3 is drawn from f (x). Obtain estimate of α by the method of moments.

  c) Let $X \sim \mathscr{P}(\lambda)$. Obtain MVBUE of λ based on a r.s. of size n. **(5 each)**

4. Attempt **any one** of the following :

a) i) State and prove Cramer - Rao inequality. **7**

ii) If X is number of successes in a series of n independent Bernoulli trials with p as probability of success in each trial then show that $\dfrac{X}{n}$ is consistent estimator of p. **3**

b) i) Explain the concept of sufficiency of an estimator with an illustration. **2**

ii) Let $X_1, X_2, ... X_n$ be a r.s. from p.d.f. $f(x) = \theta\, x^{\theta-1}$; $0 < x < 1$, $\theta > 0$.
$\qquad\qquad\qquad\qquad\qquad = 0 \qquad$; otherwise.
Obtain sufficient statistic for θ. **3**

iii) A r.v. X has p.d.f.

$$f(x) = \frac{2(\theta - x)}{\theta^2} \; ; 0 < x < \theta$$

$\qquad = 0 \qquad$; otherwise.

Obtain MLE of θ based on single observation on X. Verify whether it is unbiased. **5**

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T.Y. B.Sc. (Semester – III) Examination, 2009
STATISTICS (Paper – III) (Principal)
ST – 333 : Statistical Process Control
(Online Methods) (2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions. *: 1)* ***All*** *questions are* ***compulsory.***
2) Figures to the ***right*** *indicate* ***full*** *marks.*
3) Use of calculator and statistical tables is ***allowed.***
4) Symbols and abbreviations have their ***usual*** *meanings.*

1. a) Choose the correct alternative in **each** of the following :   **(1 each)**

   i) For certain $\bar{X}$-chart, UCL = 13.154, LCL = 10.846 and $\bar{R}$ = 2, then
      sample size n of each subgroup is

      A) 2   B) 4   C) 5   D) 7

   ii) Which of the following is not a Process control (PC) tool ?

       A) Regression analysis   B) Scatter Diagram

       C) Control chart   D) Check sheet

   iii) Computation of control limits for C-chart is based on

       A) Uniform distribution   B) Hypergeometric distribution

       C) Poisson distribution   D) Binomial distribution

   iv) When process standard deviation (σ) is specified, the 3σ control limits for
       R-chart are given by :

       A) $(D_2\bar{R}, D_1\bar{R})$ B) $(D_1\sigma, D_2\sigma)$

       C) $(D_3\sigma, D_4\sigma)$ D) $(D_4\bar{R}, D_3\bar{R})$

b) In each of the following cases state whether the given statement is true or false.

(1 each)

   i) If probability of not catching a shift in the process average on the first sample (subgroup) after the shift is denoted by β, then the probability of catching a shift in third subsequent sample after the shift is $\beta^2(1-\beta)$.

   ii) If $C_p > 1$ then it implies that the process meets the specifications.

c) i) What is Run chart ?   1
   ii) What are exact probability limits ?   1

d) i) State two uses of control chart.   1
   ii) How do we interpret 'low spots' on p-chart ?   1

2. Attempt **any two** of the following :   **(5 each)**

   a) Explain the following terms :
      i) Basis of subgroups (rational subgroups),
      ii) Frequency of subgroups (Periodicity).

   b) Distinguish between control charts for variable and control charts for attributes. Explain the construction of c-chart when standard is not given.

   c) For 20 samples each of size 5, $\overline{\overline{X}} = 0.8312, \overline{R} = 0.01435$. Assuming the process to be in control and normally distributed verify whether the process meets specification where specification limits are 0.83 ± 0.01. If the process does not meets specification estimate the percent defectives.

3. Attempt **any two** of the following :   **(5 each)**

   a) Explain the construction and interpretation of pareto diagram.

   b) Explain the following terms :
      i) Natural tolerance limits,
      ii) Specification limits.

   c) Define C_p and C_{pk} indices and interpret the following :
      i) $C_p = C_{pk}$
      ii) $C_p > C_{pk}.$

4. Attempt **any one** of the following : **(10 each)**

   a) i) Explain the construction of R and $\overline{X}$ charts when standards are not given.   **6**

      ii) A process is being controlled with a fraction non conforming control chart. Three sigma control limits are used and the procedure consists of taking daily samples of 400 items. Given LCL = 0.03172 and UCL = 0.1082720, if the process average shifts to 0.10. Calculate the probability that this shift is detected on the first subsequent sample after the shift.   **4**

   b) i) When subgroups sizes are different and value of the process fraction defective γ is not specified. Explain the construction of p-chart using stabilised control limits.   **6**

      ii) Write a short note on 'normal probability plot'.   **4**

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T.Y. B.Sc. (Semester – III) Examination, 2009
STATISTICS (Principal) (2004 Pattern)
Paper – IV : ST – 334 : Sampling Methods

Time : 2 Hours   Max. Marks : 40

Instructions : 1) **All** questions are **compulsory**.
2) *Figures to the* **right** *indicate* **full** *marks.*
3) *Use of calculator and statistical tables is* **allowed**.
4) *Symbols and abbreviations have their* **usual** *meanings.*

1. A) Choose the correct alternative in **each** of the following :   **(1 each)**

    i) In simple random sampling without replacement for attributes variance of sample proportion is

    a) $\dfrac{N-n}{nN} \cdot \dfrac{PQ}{N-1}$

    b) $\dfrac{N-n}{nN} \cdot \dfrac{PQ}{n}$

    c) $\dfrac{N-n}{nN} \dfrac{PQ}{n}$

    d) $\dfrac{N-n}{nN} \dfrac{NPQ}{N-1}$

    ii) In case of stratified random sampling with proportional allocation the size of sample from i^{th} stratum is

    a) $\dfrac{WiSi}{\sum\limits_{i=1}^{K} WiSi}$

    b) $nWiSi$

    c) $\dfrac{nWiSi}{\sum\limits_{i=1}^{K} WiSi}$

    d) nWi

    iii) In case of systematic sampling the estimator of population total X is given by

    a) $N\overline{X}_{SY}$

    b) $\overline{X}_{SY}$

    c) $(N-1)\overline{X}_{SY}$

    d) $(N+1)\overline{X}_{SY}$

    iv) Honsen and Hurwitz technique is used for the analysis of

    a) Response

    b) Non-response

    c) Sampling error

    d) Non-Sampling error

B) State whether **each** of the following statements is **true (T)** or **false (F)** : **(1 each)**

  i) Ratio estimator of population mean is always unbiased estimator.

  ii) If there is a linear trend in the population then systematic sampling is more efficient than simple random sampling without replacement (SRSWOR).

C) i) Describe a real life situation where stratified random sampling is used. **1**

  ii) Comment on the following statement giving justification.
    "SRSWR is more efficient than SRSWOR". **1**

D) i) In stratified random sampling with two strata the values of W_i and S_i are as follows :

Stratum	W_i	S_i
1	0.3	10
2	0.7	20

Compute the size of the sample from the first Stratum under Neyman's allocation if total sample size is 1100. **1**

  ii) From the list of 1000 names, simple random sample of 200 names is selected without replacement and 50 names were found to be incorrect. Estimate total number of names that needs correction in the list. **1**

2. Attempt **any two** of the following : **(5 each)**

A) Describe the method of determining the sample size in case of SRSWOR so as to meet the desired margin of error and confidence coefficient when the characteristic under consideration is continuous.

B) In case of SRSWR, derive an expression for the standard error of an unbiased estimator of the population mean.

C) Define the ratio and regression estimators of population mean. Also state the expressions for variances of these estimators and compare them.

3. Attempt **any two** of the following : **(5 each)**

A) With usual notations ignoring finite population correction (f.p.c.) prove that

$$Var(\overline{X}_n)SRSWOR \geq Var(\overline{X}_{st})PA.$$

B) In case of stratified random sampling the cost function is of the form $C = C_o + \Sigma C_i n_i$. Show that the variance of the unbiased estimator of the population mean is minimum for fixed total cost if $ni \; \alpha \; \dfrac{N_i S_i}{\sqrt{C_i}}$.

C) State the requirements of a good questionnaire.

4. Attempt **any one** of the following :

A) i) Obtain an unbiased estimator of population mean and variance of this estimator under systematic sampling. **6**

ii) The units in a population are classified into two classes C and C'. Determine the size of a sample in case of SRSWOR such that

$$P[|p - P| \geq d] = \alpha \text{ where } d = 0.05, \; \alpha = 0.05, \; N = 1000, \hat{P} = 0.5.$$ **4**

B) i) Explain the practical problems arising at planning stage of a sample survey. **6**

ii) Suggest an unbiased estimator of population mean under stratified random sampling and derive an expression for its standard error. **4**

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T.Y. B.Sc. (Semester–III) Examination, 2009
STATISTICS (Principal) (Paper–V)
ST 335 : C Programming (Turbo "C")
(2004 Pattern)

Time : 2 Hours   Total Marks : 40

N.B. :   *i)* ***All*** *questions are* ***compulsory****.*

   ii) *Figures to the* ***right*** *indicate* ***full*** *marks.*

   iii) *Symbols and abbreviations have their* ***usual*** *meaning.*

1. a) Choose the correct alternative in **each** of the following :   **(1 each)**

     i) A character variable can at a time store.
        A) 1 character   B) 8 characters
        C) 254 characters   D) 31 characters

     ii) The break statement is used to exit from
        A) an if statement   B) a for loop
        C) a program   D) the main ( ) function

     iii) Which of the following is not a valid character in C language ?
        A) +   B) ''   C) /   D) * *

     iv) Which of the following is not a relational operator in C language ?
        A) >   B) & &   C) > =   D) < =

    b) State whether **each** of the following statements is **true** or **false** :   **(1 each)**

     i) In C language for loop is used only when the number of passes is known.

     ii) The function gets ( ) is appropriate for reading a multiword string.

    c) i) What do you mean by calling a function by reference ?

     ii) Explain strl (n1) function in C.   **(1 each)**

d) i) Convert the following into corresponding C statement

$$A = \frac{7.7\,b\,(xy + a)/c - 0.8 + 2b}{(x + a)\left(\dfrac{1}{y}\right)}$$

ii) What is the output of the following program ?

   main ( )

   {

   char word [ ] = "university" ;

   print f ("% 5.3 s", word) ;

   }   **1 each**

2. Attempt **any two** of the following :

   a) Write a C program to find mean and standard deviation of a frequency distribution.

   b) Explain each of the following giving their syntax, usage and one illustration.

   i) switch   ii) if   iii) for

   c) What is recursion ? Write a C program to calculate factorial of a given number using recursion.   **(5 each)**

3. Attempt **any two** of the following :

   a) Given the co-ordinates (x, y) of the centre of a circle and its radius, write a C program to determine whether a point with co-ordinates (x_1, y_1) lies inside the circle, on the circle or outside the circle.

   b) Let $\{x_i, y_i\}$, i = 1 ... n be the n pairs of observations on (X,Y). Write a C program to find the least square regression line of Y on X.

   c) Define a pointer in C language. Explain its declaration and initialisation with an example.   **(5 each)**

4. Attempt **any one** of the following :

    a) i) Write a C program to find and print the addition of two matrices, each of the

         order m×n.   **6**

      ii) Draw a flow chart to print the sum of digits a given integer.   **4**

    b) i) Write a C program to find the real roots of quadratic equation $ax^2+bx+c=0$.   **5**

      ii) Write a C program to find the area of a triangle with three sides a, b and c.   **3**

      iii) What is a structure in C ? How it is declared ? Give one illustration.   **2**

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T.Y.B.Sc. (Semester – III) Examination, 2009
STATISTICS (Principal)
ST-336 (B) : Actuarial Statistics (Paper – VI)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory.***
                    2) Figures to the ***right*** *indicate* ***full*** *marks.*
                    3) Use of private calculator and statistical ***tables*** *is allowed.*
                    4) Symbols and abbreviations have their usual meanings.

1. a) In **each** of the following cases, choose the correct alternative :   **(1 each)**

   i) Under the assumption of uniformity of deaths in a unit interval the survival function can be written as

     A) $s(x + t) = s(x) + t\, s(x + 1)$
     B) $s(x + t) = s(x) - t\, s(x + 1)$
     C) $s(x + t) = t\, s(x) + (1 - t)\, s(x + 1)$
     D) $s(x + t) = (1 - t)\, s(x) + t\, s(x + 1)$

   ii) For feasibility of insurance business, its utility function must be

     A) Non-increasing concave
     B) Non-decreasing concave
     C) Non-decreasing convex
     D) Linear function

   iii) If $T(x) = 15$ then $K(X)$ is equal to

     A) 16   B) 14   C) 15   D(15.5

   iv) In equivalence principle, premium P is found so that

     A) $E(Z) = E(Y)$ B) $E(Z) = E\left(\dfrac{PY}{Z}\right)$

     C) $E(Z) = P\, E(Y)$ D) $E(Z) = E(PY^2)$

b) In each of the following cases, state whether the given statement is true or false : **(1 each)**

   i) Under the assumption of constant force of mortality μ and constant force of interest δ, $\overline{P}(\overline{A}x)$ is $\dfrac{\mu}{\delta}$.

   ii) With compound interest i per rupee per annum, effective rate of interest in the nth year is also ?

c) Explain each of the following terms : **(1 each)**

   i) Speculative risk

   ii) Annuity

d) Give meaning of the following : **(1 each)**

   i) $\overline{A}x$ ii) Zt

2. Attempt **any two** of the following : **(5 each)**

a) i) State any three characteristics of insurable risk.

   ii) Explain the principle of sharing losses and risk pooling used in insurance business.

b) With the effective rate of interest 9% per annum, obtain the following :

   i) Effective rate of discount.

   ii) Accumulated value of Rs. 30,000 at the end of 8th year.

   iii) Present value at the end of 3rd year of Rs. 10,000.

   iv) Nominal rate of interest convertible six monthly.

c) Under the assumption of uniform distribution of deaths in unit interval.

   $l_{36} = 9612, l_{37} = 9587, l_{38} = 9560$

   Find :

   i) $\mu_{37.5}$ ii) $1.5^{P}36$

3. Attempt **any two** of the following : **(5 each)**

a) Define survival function of (x). Also show that the probability density function g(t) of T(x) is given by

$g(t) = {}_tp_x \; \mu_{x+t} \; ; t \geq 0$.

b) Z is the present value random variable for whole life insurance with death benefits payable at the moment of death of (x). If for $t \geq 0$, $b_t = e^{0.05t}$, $\delta_t = 0.06$ and $\mu_x(t) = 0.01$, obtain E(Z) and var(Z).

c) Survival rates P_x for a certain population are given below :

Age in Years (x)	0	1	2	3	4	5	6
P_x	0.8	0.75	0.7	0.4	0.2	0.1	0.0

Construct the columns l_x, L_x and T_x for a radix of 10,000.

4. Attempt **any one** of the following :

a) i) On May 6, 1996 (67) bought Rs. 1,00,000/- whole life insurance policy with death benefit payable at the end of the year of death. The policy is paid for by means of annual premiums, payable at the start of each year the policy remains in force. The policy holder lies on August 6, 2003 and the loss to the insurer was Rs. 30,000/-. If i = 0.06, What was the annual premium paid ? **5**

ii) Show that the condition for mutually advantageous insurance policy is $G \geq \mu$ where G represents one time premium and μ stands for expected value of loss random variable stating appropriate assumptions. **5**

b) i) If for the annuity certain, the payments are made at the begining of year in each year for the period of n years then show that

$\ddot{S}_{\overline{n}|} = (1+i)^n \; \ddot{a}_{\overline{n}|}$. **5**

ii) Show that force of interest at timet (δ_t) is independent of t. **3**

iii) State two uses of life table. **2**

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T.Y. B.Sc. (Semester – III) Examination, 2009
STATISTICS (Principal) (Paper – VI)
ST – 336 (C) : Statistical Computing Using R Software
(Online Paper) (2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions :   i) ***All*** *questions are* ***compulsory****.*
              ii) *Figures to the* ***right*** *indicate* ***full*** *marks.*
              iii) ***Each*** *question is to be solved using* ***R*** *Software installed on your computer.*
              iv) ***Attach*** *computer printout of your work to the answer book supplied to you.*

1. Attempt **each** of the following :   **(1 each)**

   a) A vector x contains elements 10, 12, 15, 9, 7,16, 21, 14, 8. Create a vector y from x containing elements of x less than 10.

   b) Find mean and median of following observations.
      2, 7, 9, 5, 8, 17, 6, 3, 12, 15

   c) Draw a random sample of size 8 from a Poisson distribution with mean 3.5.

   d) Create a data frame of roll number and marks obtained by 10 students.

   e) Draw a simple random sample of size 5 from a population of 30 units using SRSWOR.

   f) Draw a box plot of following data on number of accidents on a certain road for 10 days.
      2, 5, 1, 0, 3, 6, 4, 8, 3, 7.

   g) Simulate an experiment of tossing a die 50 times and prepare its frequency distribution.

   h) Draw a rod plot of following data :

x :	2	4	6	8	10
f :	7	13	24	18	3

   i) Access data cars and obtain its summary statistics.

   j) Let $X \sim B\,(n = 8, p = 0.4)$. Find $P[X \leq 3]$ and $P[X > 6]$.

2. Attempt **any two** of the following :

   a) Draw a simple bar diagram for the following data : **(5 each)**

Year	2000	2001	2002	2003
Annual Sales (in lakh Rs.)	13.5	15.1	12.6	9.8

   b) For the following data compute first 3 central moments and measure of skewness (r_1).

Marks	0-5	5-10	10-15	15-20	20-25
No. of Students	3	7	13	18	9

   c) Find mean deviation about mean and coefficient of variation for the following observations.
   12, 41, 32, 17, 10, 9, 26, 35, 28, 16.

3. Attempt **any two** of the following : **(5 each)**

   a) Draw histogram and frequency polygon for the following data :

Length (Cms)	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
No. of bolts	17	31	47	33	8	2

   b) Fit a Poisson distribution to the following data :

x	0	1	2	3	4
f	2	7	12	18	3

   Also find expected frequencies and plot observed and expected frequencies.

   c) A group of 50 boys and 40 girls was asked to give their preferences between two brands of mobile hand sets. The results obtained were as follows :

	Brand I	Brand II
Boys	24	26
Girls	18	22

   Test at 5% level of significance the hypothesis that the preference to a particular brand of hand set is not related to sex.

4. Attempt **any one** of the following :

a) i) Following are the data on height (cms) and weight (kgs) of 8 boys :

Height	120	122	118	123	125	116	121	117
Weight	42	41	38	40	45	46	47	35

Find correlation coefficient (r) between height and weight. **5**

ii) Find Karl Pearson's coefficient of skewness for the following data :

Class	5-10	10-15	15-20	20-25	25-30
Frequency	7	11	5	2	1

5

b) i) Find geometric mean, harmonic mean, mode, lower and upper quartile for the following data :
1.5, 2.7, 3.9, 1.5, 2.5, 4.0, 1.5, 3.2. **5**

ii) Prices of share (in Rs.) of a company on 8 days in a month were found to be
75, 77, 78, 69, 70, 72, 65, 67.
Test whether the mean price of share is 69. Use 5% level of significance. **5**

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T.Y. B.Sc. (Semester – III) Examination, 2009
GEOGRAPHY (Paper –I)
Gg. 331: Resources and Environment
(2004 Pattern)

Time : 2 Hours
Max. Marks : 40

N.B. : 1) *All questions are* **compulsory.**

2) *Figures to the* **right** *indicate* **full** *marks.*

3) *Diagrams and maps must be drawn* **wherever** *necessary.*

4) **Use** *of map stencils is* **allowed**.

1. Answer the following questions in **one** or **two** sentences: **10**

   a) What are the major components of resources ?

   b) State any two advantages of solar energy.

   c) Mention the various types of exhaustible energy resources.

   d) List the parameters of quality of human resources.

   e) State any two disadvantages of the use of coal.

   f) Name any two advantages of hydroelectric power.

   g) Give any two characteristics of the equatorial forests.

   h) What is meant by renewable resources ?

   i) Name the types of coal.

   j) What is phantom pile ?

2. Write short answers **(any two):**   **10**

   a) What are the various measures of forest conservation ?

   b) State the causes of deforestation.

   c) Comment on the over exploitation of resources.

3. Write short notes **(any two):**   **10**

   a) Components of resources

   b) Biotic renewable resources

   c) Distribution of exhaustible energy resources

4. What do you mean by over population ? Explain the effects of over population on economic development.   **10**

                    OR

   Compare and contrast the lumbering activities in the tropical and temperate forests.

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T.Y. B.Sc. (Semester III) Examination, 2009
GEOGRAPHY – Paper – II
Gg – 332: Geography of Tourism
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions**: 1)* ***All *questions are **compulsory.***
2) ***Figures*** *to the right indicate full marks.*
*3) Draw neat diagrams and sketches **wherever** necessary.*
*4) Use of map stencils is **allowed.***

1. Answer the following questions in **one** or **two** sentences :   **10**
   1) State any two benefits of earning foreign exchange in tourism.
   2) Define the term "tourism".
   3) What is group tourism ?
   4) Give the types of tourist on the basis of number.
   5) State any two disadvantages of road transport.
   6) What is ITDC ?
   7) State any two pilgrim centers located along river Godavari.
   8) Mention any two hot springs from Maharashtra.
   9) What is rail Yatribhavan ?
   10) State any two virtues of an ideal tourist guide.

2. Write short answers **(any two)** :   **10**
   a) Differentiate international and domestic tourists.
   b) Describe the impact of topography on tourism.
   c) Discuss the role of transportation in modern tourism.

3. Write short notes **(any two)** :   **10**
   a) Tourism and national integration.
   b) Elements of tourism.
   c) Hill stations in Maharashtra.

4. Discuss the role of geography in tourism. Provide suitable examples.   **10**

                      OR

Describe the types of tourist on the basis pf purpose of travel.

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T.Y. B.Sc. (Semester – III) Examination, 2009
GEOGRAPHY (Paper – III)
Gg. 333 : Fundamentals of Geographical Information System (GIS)
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory.*
      2) *Figures to the* ***right*** *indicate* ***full*** *marks.*
      3) *Diagrams and maps must be drawn* ***wherever*** *necessary.*
      4) ***Use*** *of map stencils is* ***allowed.***

1. Answer the following questions in **one** or **two** sentences :   **10**

   a) What is data ?

   b) State any two objectives of GIS.

   c) Write two alternative names of GIS.

   d) Define the term GIS.

   e) List the components of GIS.

   f) What is thematic data ?

   g) Define the term pixel in raster GIS.

   h) Name the locational attributes obtained by a GPS.

   i) When does data become information ?

   j) What is DBMS ?

2. Write short answers (**any two**) :   **10**

   a) Differentiate between maps and GIS.

   b) State the limitations of GIS.

   c) Discuss the nature of attribute data.

3. Write short notes (**any two**) : **10**

   a) Run length encoding

   b) Topology

   c) Spatial data.

4. Give a detailed account of the development of GIS. **10**

OR

Give an account of the various sources of data in GIS.

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T.Y. B.Sc. (Semester – III) Examination, 2009
GEOGRAPHY (Paper – IV)
Gg - 334 : Geography of India
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Figures to the ***right*** *indicate* ***full*** *marks.*
3) Draw neat diagrams and sketches ***wherever*** *necessary.*
4) ***Use*** *of map stencils is* ***allowed****.*

1. Answer the following questions in **one** or **two** sentences :   **10**

   1) State latitudinal and longitudinal extent of India.

   2) Name the wettest place in peninsular India.

   3) State any two states that are drought-prone.

   4) Where are, in India, the most ancient rock formations found ?

   5) What is "Deccan trap" ?

   6) What is *"murum"* ?

   7) What do you mean by "Bay Islands" ?

   8) Mention any two plateaus that make the central Indian Highland.

   9) Name a major river from peninsular India that meets are Arabian sea.

   10) What is "Sundarbans" known for ?

2. Write short answers (**any two**) :   **10**

   a) Discuss islands as a physiographic division of India.

   b) Comment on relative location of India.

   c) Describe salient features of Himalayan rivers.

3. Write short notes (**any two**) : **10**

   a) Floods in India

   b) Monsoon weather

   c) Mangrove forest

4. Discuss the causes and impact of drought in peninsular India. **10**

       OR

Describe distribution of major soil types of India.

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T.Y. B.Sc. (Semester – III) Examination, 2009
GEOGRAPHY : Paper – V
Gg-335 : Geography of Soils
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* ***All*** *questions are* ***compulsory****.*
          2) Figures to the ***right*** *indicates* ***full*** *marks.*
          3) Diagrams and maps must be drawn ***wherever*** *necessary.*
          4) Use of map stencils is allowed.

1. Answer the following quesitons in **one** or **two** sentences :   **10**

   a) Define Pedology.

   b) Mention major components of soil.

   c) What do you understand by the term leaching ?

   d) Define the term weathering.

   e) Give any two examples of oxidation process.

   f) State the process of soil genesis.

   g) Give the names of any two types of Clay minerals.

   h) Mention major types of soil structure ?

   i) What are ISSS and USDA ?

   j) State the limit range of diameter for Clay, Silt, and Sand according to USDA.

2. Write short answers (**any two**) :   **10**

   a) Explain the process of Podzolization.

   b) What is the significance of soil moisture ?

   c) What do you understand by the process of Oxidation-reduction ?

3. Write short notes (**any two**) :

   a) Soil profile

   b) Minerals in the tropics

   c) Formation of humus.   **10**

4. Outline brief history of soil science and state the importance of soil studies.

                          OR

   Explain various processes of weathering.   **10**

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T.Y. B.Sc. (Sem. – III) Examination, 2009
GEOGRAPHY (Paper – VI)
Gg-336 : Fundamentals of Remote Sensing
(2004 Pattern)

Time : 2 Hours

Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
2) *Figures to the* **right** *indicate* **full** *marks.*
3) *Diagrams and maps must be drawn* **wherever** *necessary.*
4) *Use of map stencils is* **allowed**.

1. Answer the following questions in **one** or **two** sentences : **10**
    a) What do you mean by electromagnetic energy ?
    b) What is wavelength ?
    c) What is vertical photograph ?
    d) What is Scanner ?
    e) What is platform ?
    f) What does ISRO stands for ?
    g) What satellite ?
    h) What does LIDAR stands for ?
    i) What do you mean by scale of the photograph ?
    j) What is swath ?

2. Write short answers **(any two)** : **10**
    a) Write a note on electromagnetic spectrum.
    b) What is Absorption ?
    c) What is annotation strip on aerial photograph ?

3. Write short notes on **(any two)** : **10**
    a) Types of aerial cameras.
    b) False color composite.
    c) Panchromatic photographs.

4. Explain in detail the visual methods of image or photo interpretation. **10**

OR

How aerial photographs are useful than satellite images ?

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T.Y. B.Sc. (Sem. – III) Examination, 2009
MICROBIOLOGY (Paper – I)
MB 331 : Medical Microbiology
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B.: *1)* **All** *questions are* **compulsory**.
       2) **All** *questions carry* **equal** *marks.*
       3) Draw **neat** *labelled diagram* **wherever** *necessary.*

1. A) Choose the correct option :   **5**
   1) Following organism gives urease test positive
      a) E. coli   b) Pseudomonas aeruginosa
      c) Proteus vulgaris   d) Staphylococcus aureus
   2) 'Blue pus' is caused by
      a) Pseudomonas aeruginosa   b) Staphylococcus aureus
      c) Streptococcus pyogenes   d) E. coli
   3) Venkatraman-Ramakrishnan medium is used for cultivation of
      a) E. coli   b) S. aureus
      c) Vibrio cholerae   d) Streptococcus pyogenes
   4) Travellers' diarrhoea is caused by
      a) EPEC   b) EIEC
      c) ETEC   d) EHEC
   5) The human _____ is the only reservoir of meningococcus.
      a) intestine   b) nasopharynx
      c) brain   d) skin

   B) Match the following :   **5**
   1) TCBS   a) Salmonella
   2) Salt-milk agar   b) V. cholerae
   3) Lowenstein-Jensen medium   c) Pseudomonas
   4) Wilson and Blair medium   d) M. tuberculosis
   5) Cetrimide agar   e) S. aureus

P.T.O.

2. Comment on **any two** : **10**

   a) Importance of case control study.

   b) Palhogenesis of <u>shigella</u>.

   c) Antigenic properties of <u>Pneumococci</u>.

3. Attempt **any two** : **10**

   a) Diagrammatically represent the structure of skin.

   b) Justify-clostridia have limited invasive power but still responsible for life threatening diseases.

   c) Discuss antigenic structure of <u>streptococci</u>.

4. Attempt **any one** : **10**

   A) Describe Widal test.

   B) Describe laboratory diagnosis of pulmonary tuberculosis.

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T.Y. B.Sc. (Semester – III) Examination, 2009
MICROBIOLOGY (Paper – II)
MB – 332 : Genetics and Molecular Biology
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are **compulsory**.
         2) *All* questions carry **equal** marks.
         3) Draw **neat** labelled diagrams **wherever** necessary.

1. Attempt the following (**All** sub questions are **compulsory**).

   i) Write two characters of Z-DNA, that differentiate it from B-DNA.   **10**

   ii) Define – Euchromatin.

   iii) Define – Syntrophism.

   iv) State true or false – DNA replication in E.coli is unidirectional.

   v) State true or false – concentration of free DNA does not affect the process of transformation in bacteria.

   vi) Match the following :

A	**B**
a) Okazaki fragments	1) Bacteriophage
b) Transduction	2) Linker histone
c) H1	3) Lagging strand
d) F' strain	4) Artificial transformation
e) E.Coli	5) Plasmid carrying bacterial gene.

2. Attempt **any two** of the following :   **10**

   a) Describe J.Cairn's experiment with respect to structure of bacterial DNA.

   b) Explain properties of F. Plasmid.

c) Explain the principle of interrupted mating experiment.

3. Draw Diagrams only (**any two**) :   **10**

   a) Breakage and reunion model of recombination.

   b) Development of competence in gram positive bacteria.

   c) Replication Fork in bacterial DNA replication.

4. Attempt **any one** of the following :   **10**

   a) What is genetic complementation ? Explain complementation with the help of tryptophan synthetase in E.coli.

   b) Explain specialized transduction mediated by lambda phage with respect to

      i) Generation of specialized transducing phage

      ii) Transfer of bacterial gene.

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T.Y.B.Sc.(Semester – III) Examination, 2009
MICROBIOLOGY (Paper – III)
MB-333 : Enzymology And Biochemistry
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* ***All*** *questions are* ***compulsory.***
         2) ***All*** *questions carry* ***equal*** *marks.*
         3) Draw neat labelled diagrams ***wherever*** *necessary.*
         4) In Q. ***1*** *all subquestions are* ***compulsory.***

1. Attempt the following :   **10**

   A) a) Vit B-1 is water insoluble vitamin (State true or false).

      b) Define one katal.

      c) What is isoelectric p^H ?

      d) Enlist two physical methods of disruption of cells and tissues.

      e) In uncompetitive type of enzyme inhibition km increases and Vmax decreases
         (State true or false).

   B) Match the following :

      f) Pyrurate carboxylase   i) Tryptophan operon

      g) Cation exchanger   ii) Endopeptidase

      h) Elastases   iii) Biotin

      i) Feedback repression   iv) DEAE-sephadex

      j) Anion exchanger   v) CM-sephadex

                                                                                                    P.T.O.

2. Attempt **any two** of the following :   **10**

   a) What are metalloenzymes ? Describe with suitable example.

   b) Explain how to assay enzyme by luminescence method.

   c) What is feedback inhibition ? Enlist the types and explain one type with suitable examples.

3. Attempt **any two** of the following :   **10**

   a) Draw the structure of pantothenic acid and its coenzyme form and describe its biochemical role with suitable example.

   b) Enlist any 2 methods of plotting kinetic data and explain any one with graphical representation.

   c) What are zymogens illustrate the proteolytic activation of zymogen with suitable example.

4. Attempt **any one** of the following :   **10**

   a) Using equilibrium approach derive Michaelis menten equation for single substrate enzyme catalyzed reaction.

   b) Explain the principle, working and applications of Isoelectric Focussing of protein.

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T.Y. B.Sc. (Semester – III) Examination, 2009
MICROBIOLOGY (Paper – IV)
MB-334 : Immunology (2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. :   1) **All** questions are **compulsory**.
            2) **All** questions carry **equal** marks.
            3) Draw neat labelled diagrams **wherever** necessary.
            4) In question no. **1 all** sub-questions are **compulsory**.

1. A) Match the following and rewrite :   **5**

   i) VDRL test   a) phagocytes

   ii) IgM   b) agglutination

   iii) Metchnikoff   c) dimer

   iv) Widal test   d) precipitation

   v) sIgA   e) Pentamer

   B) Answer in short :   **5**

   i) Enlist types of T Lymphocyte.

   ii) Write example of an adjuvant.

   iii) Name a fluorescent dye.

   iv) What is the source of complement in CFT ?

   v) Name any one mediator of inflammation.

2. Write short notes on **– any two** :   **10**

   A) Development of hybridoma.

   B) Indirect ELISA.

   C) Types of immunogen.

3. Attempt **any two** :   **10**

   A) Illustrate diagrammatically – structure of thymus.

   B) Compare in tabular form – Innate and Acquired immunity.

   C) Explain - gene segments controlling V_H domain formation.

4. Describe **any one** :   **10**

   A) Activation of B-cell.

   B) Structure of IgG.

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T.Y. B.Sc. (Semester – III) Examination, 2009
MICROBIOLOGY (Paper – V)
MB 335 – Fermentation Technology
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** *questions are compulsory.*
2) **All** *questions carry* **equal** *marks.*
3) **Draw** *neat, labelled diagrams* **wherever** *necessary.*

1. A) Fill in the blanks :   **5**

    i) Beet molasses is used as _____ source in media formulation for large scale fermentation.

    ii) Erlenmeyer flasks are used for fermentation studies at _____ level of fermentation.

    iii) According to patent act, the patent is protected for _____ years.

    iv) Replica plate technique is used for isolation of a _____ mutants during strain improvement programme.

    v) Medium optimization by the classical approach involves changing _____ independent variable at a time.

    B) Match the following :   **5**

A	B
1) <u>Corynebacterium glutamicum</u>	a) Endotoxin detection
2) LAL test	b) Precursor for Penicillin production
3) Phenyl acetic acid	c) Temperature control
4) On-line sensor	d) Turbidometric quantitation
5) Bioassay	e) Glutamic acid production

P.T.O.

2. Attempt **any two** :   **10**

   a) Explain in brief various methods for monitoring and control of temperature during fermentation.

   b) Explain the concept of market potential with respect to fermentation economics.

   c) State objectives of scale up.

3. Attempt **any two** :   **10**

   a) Explain in brief batch sterilization of fermentation media.

   b) With suitable example state the role of antifoams in fermentation media.

   c) Explain how analogue resistant mutants are used for strain improvement.

4. Attempt **any one** :   **10**

   a) Explain the principle and give protocol for toxicity testing of the fermentation product.

   b) What is biological assay ? Describe the method for quantitation of antibiotic using bioassay technique.

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T.Y. B.Sc. (Sem. – III) Examination, 2009
MICROBIOLOGY (Paper – VI)
MB – 336 : Food and Dairy Microbiology
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory.***
                        2) ***All*** *questions carry* ***equal*** *marks.*
                        3) ***Draw*** *neat labelled diagrams* ***wherever*** *necessary.*

1. Answer the following :   **10**

   A) The temperature used in HTST is _____ °C.

   B) Define D – value.

   C) The substrate used in phosphatase test is _____

   D) Define skimmed milk.

   E) The organism causing ropiness in milk is _____

   F) Name any two organisms involved in food infection.

   G) The intrinsic factors of food affecting microbial growth are _____ and
      _____

   H) Blue colour defect in milk is due to _____ organism.

   I) Enlist any two chemical preservatives used in food preservation.

   J) What is tenderization of meat ?

2. Attempt **any two** :   **10**

   A) Explain spoilage of fruits and vegetables.

   B) Explain LTHT method of pasteurization of milk.

   C) Define milk and add note on types of milk.

P.T.O.

3. Attempt **any two** :   **10**

   A) Explain food poisoning by clostridium botulinum.

   B) Explain phosphatase test.

   C) Explain spoilage of canned foods.

4. Enlist different methods of food preservation and explain principles of food
   preservation by chemicals.   **10**

                              OR

   Describe spoilage of milk with respect to sweet curdling, stormy fermentation and
   ropiness.

                    _____

T.Y. B.Sc. (Semester – III) Examination, 2009
ELECTRONIC SCIENCE (Paper – I)
EL-331 : Analog Circuits And Systems
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.
        2) *Draw neat diagrams* *wherever* *necessary*.
        3) *Figures to the* *right* *indicate* *full* *marks*.

1. **All** subquestions are **compulsory** :

   a) Write the value of β in case of Wien Bridge and phase shift oscillators for
      sustained Oscillations.   **1**

   b) State any two differences between JFET and MOSFET.   **1**

   c) What is thermal drift of OPAMP ?   **1**

   d) What are the basic requirements of a DAS ?   **1**

   e) "Higher order filters are necessary"-comment.   **2**

   f) For inverting zero crossing detector, if input is $12V_{pp}$ sinusoidal of 1 KHz. Draw
      input and output waveforms. Given $\pm V_{cc} = \pm 15V$.   **2**

   g) "Tachometers are used as speedometers"-comment.   **2**

   h) For PLL IC 565 circuit, determine the Lock range frequency if $\pm V_{cc} = \pm 10V$,
      and free running frequency is 2KHz.   **2**

2. Answer **any two** of the following :

   a) With suitable circuit diagram, explain temperature compensated Log Amplifier
      using transistor as Logging element.   **4**

   b) Explain Basic principle of PLL with suitable block diagram. List its various
      applications.   **4**

   c) List the advantages of Digital thermometer. State the working principle of Digital
      thermometer.   **4**

3. Answer **any two** of the following :

a) Draw block diagram of Electronic generalised measurement system. Explain each block in brief. **4**

b) Explain working of Frequency to voltage (F/V) converter using suitable circuit diagram. Derive the expression for output voltage. **4**

c) State the important factors that decide the configurations of DAS. List various configurations of DAS. **4**
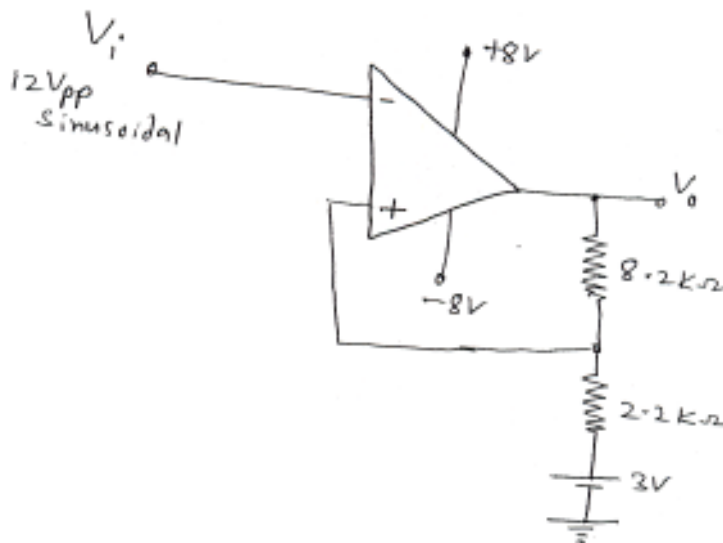
4. Answer the following :

a) With neat block diagram, explain working of DFM. State various measurement modes of DFM. **6**

b) Write a note on "Computer based DAS". **6**
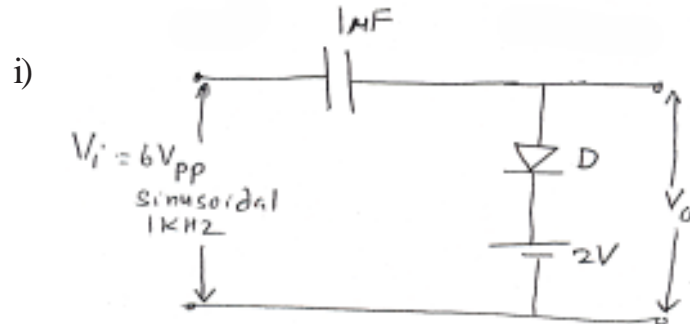
OR

4. Answer the following :

a) For the following circuit, calculate V_{UT}, V_{LT} and V_H and draw transfer characteristics. **4**

b) Draw input and output waveforms for the following circuits by assuming ideal diodes.   **4**

i)

ii)
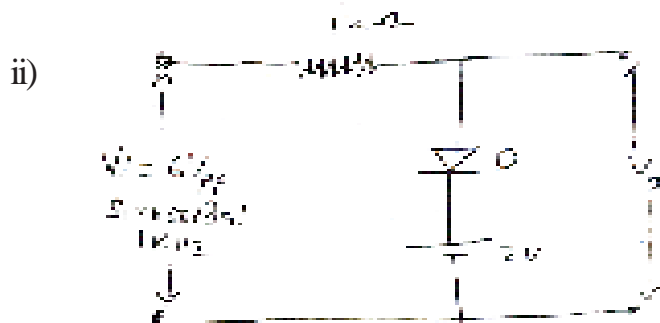
c) For VCO circuit using IC 566, $V_{cc} = 12V$, $R_1 = 15k\Omega$, $C_1 = 0.0047\mu F$, $R_2 = 1K\Omega$, $R_3 = 10K\Omega$.   **4**

Determine the nominal frequency of output squarewave signal and draw the circuit diagram.

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T.Y. B.Sc. (Semester – III) Examination, 2009
ELECTRONIC SCIENCE (Paper – II)
EL – 332 : Microcontrollers
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Note : i) **All** questions are **compulsory**.
    ii) *Neat diagram must be drawn* **wherever** *necessary.*
    iii) *Figures to* **right** *indicate* **full** *marks.*
    iv) **Use** *of calculator is* **allowed**.

1. Attempt the following :

   a) List basic elements of microcomputer.   **1**

   b) State dual role of port 0 of microcontroller 8051.   **1**

   c) Identify the addressing mode of MOV @ Ro, 80H.   **1**

   d) What is function of TMOD register in 8051 ?   **1**

   e) State merits of microcontroller over microprocessor.   **2**

   f) Write the instruction to select register Bank 3 of internal RAM.   **2**

   g) For 8051 microcontroller if crystal frequency is 12 MHz, how much time it
      takes to execute one machine cycle ?   **2**

   h) Distinguish between RL A, RLC A. instructions.   **2**

2. Attempt **any two** of following :

   a) Draw and explain programming model of μc 8051.   **4**

   b) What is timer/counter unit of μc 8051 ? Explain in brief various modes of timer. **4**

   c) Explain immediate and direct addressing mode in μc 8051 with suitable example. **4**

3. Attempt **any two** of the following :

   a) With the help of neat diagram explain interfacing of stepper motor to μc 8051. Draw flow chart for rotating stepper motor clock wise.　**4**

   b) Write assembly language program to copy a block of ten bytes stored in RAM starting from location 60H to RAM starting from 70H using register indirect addressing.　**4**

   c) What is stack ? How stack is used in execution of CALL instruction ?　**4**

4. Attempt the following :

   a) Draw the circuit diagram to interface two thumb wheel switches to port 0 of μc 8051. Write assembly program to read 8 bit data from thumb-wheel switches, separate the nibbles and store higher nibble in R_7 and Lower nibble in R_6.　**6**

   b) With the help of neat diagram interface 8 K byte RAM and 8 K byte EPROM to μc 8051. Write down its memory map.　**6**

                     OR

4. Attempt the following :

   a) Draw architecture of 8086.　**4**

   b) Write subroutine to generate time delay using two registers.　**4**

   c) Write assembly program to multiply two 8 bit numbers stored in RAM. Store the result in RAM.　**4**

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T.Y. B.Sc. (Semester–III) Examination, 2009
ELECTRONIC SCIENCE (Paper–III)
EL 333 : Modeling and Simulation using C & MATLAB
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. :   *i) Attempt **all** questions.*
      *ii) Neat diagrams must be draw **wherever** necessary.*
      *iii) Numbers to the **right** indicates **full** marks.*
      *iv) **Use** of calculators is **allowed**.*

1. Answer **all** of the following :

    a) Describe MATLAB commands abs (x) and log 10 (x).   **1**

    b) Define Laplace Transform of function f (t).   **1**

    c) Which of the following are valid identifiers ? If invalid give reason.

      i) books8   ii) 8book   **1**

    d) What is Bode plot ?   **1**

    e) Find Laplace Transform of e^{5t}.   **2**

    f) State limitations of Fourier Series.   **2**

    g) "All variables in MATLAB are arrays without the need of defining its size".

      Comment.   **2**

    h) "Poles and zeros provide useful information in network function". Comment.   **2**

2. Answer **any two** of the following :

    a) Using Laplace Transform solve differential equation

      $Y'' + 9Y = 0$, satisfying $Y(0) = 0 \,\&\, Y'(0) = 2$ given $L^{-1}\left\{\dfrac{3}{S^2 + 9}\right\} = \mathrm{Sin}\,3^t$.   **4**

    b) What is two port network ? Give various parameters related with 2-port network.   **4**

    c) State the general format of 3-D line plot in MATLAB and explain it in brief.   **4**

3. Answer **any two** of the following :

   a) Plot the function $Y = 3x^3 - 26x + 6$, and its first and second derivative, for

   $-2 \leq x \leq 4$ all in the same plot (select step of 0.01). **4**

   b) Determine Fourier coefficient a_0 and a_n for the following function

   $f(t) = a$ for $0 < t < {}^T\!/_2$

   $= 0$ for ${}^T\!/_2 < t < T.$ **4**

   c) Describe assignment operators used in C. What is purpose of each ? **4**

4. Answer the following :

   a) Derive an expression for Laplace Transform of periodic function. **6**

   b) What is the purpose of control string in print f statement ? What is composition

   of control string ? **6**

                   OR

4. Answer the following :

   a) For series RC circuit $V_0 = 10$ V, $R = 10\Omega$, $C = 0.01$ F. The equation for

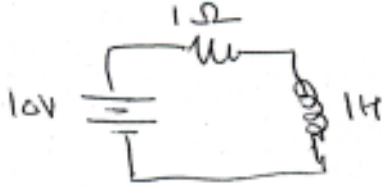 $I(s)$ is $I(s) = \dfrac{V_0/R}{S + {}^1\!/_{RC}}$. **4**

   Determine $i(t)$ using Inverse Laplace Transform at $t = 0.1$ second.

   b) What is variable ? How it is defined in MATLAB ? Give rules regarding

   variable names. **4**

c) In step response of LR circuit shown below current i(t) is given by

$$i(t) = \frac{V_0}{R}\left[1 - e^{-(R/L)\cdot t}\right]$$

Write a program in C to find i (t). Value of t to be entered during program execution.   **4**

T.Y. B.Sc. (Sem. – III) Examination, 2009
ELECTRONIC SCIENCE (Paper – IV)
EL-334 : Electromagnetic Fields and Waves
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All questions are **compulsory**.*
2) *Draw **neat** diagrams **wherever** necessary.*
3) *Figures to the **right** indicate **full** marks.*

[Given : $\in_0 = 8.854 \times 10^{-12}$ c^2 / Nm^2, $\mu_0 = 4\pi \times 10^{-7}$ Wb/Am]

1. **All** subquestions are **compulsory** :

   a) Define electric flux.   **1**

   b) State Amperes Circuital Law.   **1**

   c) What is reluctance ?   **1**

   d) Define vector current density $\vec{J}$.   **1**

   e) Find the electric field intensity 1.5 m away from a charge 7×10^{-5} C.   **2**

   f) A long straight wire carries a current of 10 A. Find the distance at which the

      magnetic field $\vec{H}$ is 1 Am^{-1}.   **2**

   g) Changing magnetic field produces changing electric field : comment.   **2**

   h) The greater the permittivity, the greater is the flux density for a given electric field :
      comment.   **2**

2. Attempt **any two** of the following :

   a) Obtain the relation between E, D and P.   **4**

   b) Prove that $\bar{J}_m = \nabla \times \overline{M}$, where J_m = Magnetization current density and

      $\overline{M}$ =Magnetization vector.   **4**

   c) Using Faradays law of electromagnetic induction obtain the Maxwell's equation :

      $$\nabla \times \overline{E} = -\frac{\partial \overline{B}}{\partial t}.$$ **4**

P.T.O.

3. Attempt **any two** of the following :

   a) Draw the block diagram of CRT and explain the function of each part in brief.   **4**

   b) State and prove the Poynting vector theorem.   **4**

   c) Derive an expression for the force acting between two parallel wires carrying different amounts of current.   **4**

4. Attempt **all** the following :

   a) A parallel plate capacitor of plate area 0.01 m² is filled with dielectric material of dielectric constant 5. Its capacitance is 2nF and 25 volts are applied across the plates. Find the electric flux intensity in the dielectric.   **4**

   b) The inductance of a closely wound coil is such that an emf of 2.5 V is induced when the current changes at a rate of 5 A/sec; calculate the inductance of a coil.   **4**

   c) An electron is accelerated by travelling through a potential difference of 2.5 kV. Find its velocity. (Given : $|e| = 1.6 \times 10^{-19}$ C, $m_0 = 0.91 \times 10^{-30}$ kg).   **4**

   OR

4. Attempt **all** of the following :

   a) Starting from Maxwells equation from Amperes law, obtain wave equation for electric field intensity.   **6**

   b) An electromagnetic wave is incident normally at the boundary between two dielectric media of refractive indices n_1 and n_2 respectively. Show that the magnitude of transmitted electric field intensity is $E_T = \left(\dfrac{2n_1}{n_1 + n_2} \right) E_i$.   **6**

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T.Y. B.Sc. (Semester – III) Examination, 2009
ELECTRONIC SCIENCE (Paper – V)
EL-335 (A) : Power Electronics – I
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Notes :   *i)* ***All*** *questions are* ***compulsory.***
         ii) Neat diagrams must be drawn ***wherever*** *necessary.*
         iii) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Answer **all** of the following :

   a) State the switching control device which find major industrial applications.   **1**

   b) State any two industrial applications of power electronics.   **1**

   c) Define transconductance g_m of MOSFET device.   **1**

   d) Classify power semiconductor diodes based on reverse recovery time.   **1**

   e) What are advantages and disadvantages of SITH's and RCT's ?   **2**

   f) What are the main difference between BJT's and MOSFET's ?   **2**

   g) Draw symbol for SUS and SBS.   **2**

   h) What is difference between SCR and TRIAC ?   **2**

2. Answer **any two** of the following :

   a) What is the output characteristics of MOSFET ? Explain concept of saturation in BJT and MOSFET.   **4**

   b) What is Snubber ? Discuss the design consideration of RC Snubber network.   **4**

   c) What is PUT ? Design the triggering circuit of PUT as relaxation oscillator. The parameters of PUT are source voltage $V_s = 20V$, $I_G = 1.5$ mA. The frequency of oscillator f = 100Hz, pulse width is $t_g = 40\mu$ sec and peak triggering pulse $V_{Rk} = 8V$, c= 0.5 μF.   **4**

3. Solve **any two** of the following :

   a) Give classification of chopper. Draw circuit of class A and explain action of it. Give one application of chopper circuit. **4**

   b) What is principle of operation of cycloconverter ? What are advantages of it ? **4**

   c) Draw the circuit of step down chopper. Explain how power flow is controlled. **4**

4. Answer **any two** of the following :

   a) What are types of force commutation for ac-dc converters ? Explain sinusoidal pwm converter with necessary wave forms. What is modulation index ? **6**

   b) Draw schematic diagram structure, symbol and V-I characteristics of thyristor. Explain what are latching current, holding current ? Draw two transistors equivalent model of thyristor. Explain gate triggering action. **6**

   c) Explain the principle of step up operation in chopper with proper circuit and waveforms. State performance parameters of chopper. **6**

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T.Y. B.Sc. (Semester – III) Examination, 2009
ELECTRONIC SCIENCE (Paper – V)
EL-335 (B) : Principles and Applications of Sensors – I

Time : 2 Hours   Max. Marks : 40

N.B. :   *i)* **All** *questions are* **compulsory**.
        ii) Figures to the **right** *indicate* **full** *marks.*
        iii) Draw neat diagrams **wherever** *necessary.*

1. Attempt **all** of the following :

   a) What is seeback effect ?   **1**

   b) State at least two names of gas sensors.   **1**

   c) What do you mean by PTAT ? State its significance.   **1**

   d) State transduction principle of magnetostrictive sensor.   **1**

   e) Sensor is a transducer but transducer is not a sensor : comment.   **2**

   f) Environmental parameters can affect the performance of the sensor : comment.   **2**

   g) State the basic characteristics of radiation sensor.   **2**

   h) Hazardous environment can be detected/indicated by a gas sensor : comment.   **2**

2. Attempt **any two** of the following :

   a) State and explain in brief classification of sensors based on different transduction
      principles.   **4**

   b) Define the following terms :   **4**
      i) Accuracy   ii) Sensitivity
      iii) Resolution   iv) Linearity

   c) How is a bath tub curve associated with failures of transducers ? What are the
      screening steps for sensors/transducers ?   **4**

3. Attempt **any two** of the following :

   a) What are the different types of acoustic sensors ? Explain pulse-echo transit time acoustic temperature sensor with requisite diagram. **4**

   b) Write a short note on eddy current sensor. **4**

   c) Explain with suitable diagram resistive moisture sensor. **4**

4. Attempt **any two** of the following :

   a) What is MI thermocouple ? Explain its construction and working principle. **6**

   b) Describe optical fibre sensor for liquid level measurement. **6**

   c) Show that differential current output is proportional to the position of position sensitive cell. **6**

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T.Y. B.Sc. (Semester – III) Examination, 2009
ELECTRONIC SCIENCE (Paper – V)
EL-335 (C) : Industrial Electronics – I

Time : 2 Hours   Max. Marks : 40

N.B. : *i) Answer **all** questions.*
*ii) Numbers to the **right** indicate **full** marks.*
*iii) Neat diagrams must be drawn **wherever** necessary.*

1. Answer **all** of the following :

   a) What is purpose of grounding ?   **1**

   b) Name any two first aid tool.   **1**

   c) How mechanical drawing helps to purchase specific parts ?   **1**

   d) What do you mean by layout of PCB's ?   **1**

   e) Mention any two piolet control devices used in industries. Give one application of each.   **2**

   f) What type of PCB is used to design mother board of a computer system ?   **2**

   g) Give any two specifications of fuse.   **2**

   h) Find the resistance of 1 mm wide conductor of 1 cm length of standard copper foil of $35\,\mu$ m thickness. Give resistivity of copper foil $\rho = 1.724 \times 10^{-8}\,\Omega.\text{cm}$ **2**

2. Answer **any two** of the following :

   a) What is an electrical shock ? List general electrical safety precautions regarding electrical shocks and possibility of fire.   **4**

   b) State the features of PCB design software. Explain the use of standard libraries in the software for digital counter and timer.   **4**

   c) What are main causes of fire in industries ? What precautions should be taken to protect from fire ?   **4**

3. Answer **any two** of the following :

   a) What is composition of elements in soldering materials ? State properties of soldering materials. **4**

   b) Explain the importance of sensors and actuators in industries. **4**

   c) Explain design consideration and methods for arranging cases of electronic equipments. **4**

4. Answer **any two** of the following :

   a) What is layout sketch, mechanical drawing and assembly drawing of a PCB ? Why documentation is necessary in industries ? **6**

   b) What are the main problems that can affect digital PCB's ? Explain SMD mounted PCB technologies. **6**

   c) What are various industrial control devices ? Explain any one example of piolet motor control device applications. **6**

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T.Y. B.Sc. (Semester – III) Examination, 2009
ELECTRONIC SCIENCE (Paper – V)
EL-335 (D) : Computer Service Management – I

Time : 2 Hours   Max. Marks : 40

N.B. :   *1) **All** questions are **compulsory**.*
          *2) Figures to the **right** indicate **full** marks.*
          *3) Draw neat diagram **wherever** necessary.*

1. **All** questions are **compulsory** :

   a) List different operating systems.   **1**

   b) What is the size of system bus in P IV processor ?   **1**

   c) Which command is used to format and then copy system files on C drive ? **1**

   d) What do you understand by ISP ?   **1**

   e) List four main types of IDE interfaces used in PC.   **2**

   f) What do you mean by track and sector ?   **2**

   g) List different types of portable systems.   **2**

   h) What are different types of MODEM standards ?   **2**

2. Attempt **any two** of the following :

   a) With neat diagram explain the working of read/write head in HDD.   **4**

   b) Explain basic components of PC in brief (any 4)   **4**

   c) What is the difference between DOS and windows operating system ?   **4**

3. Attempt **any two** of the following :

   a) Write important trouble shooting steps if CD-ROM fails to read a CD.   **4**

   b) Discuss the advantages and limitations of Laptop over desktop.   **4**

   c) What is the difference between internal and external modem ?   **4**

4. Attempt **any two** of the following :

   a) With neat block diagram explain the working of HDD. List different procedures
      for installation of HDD.   **6**

   b) What are the basic tools required for maintenance of PC ? Explain in brief. **6**

   c) Discuss trouble shooting of sound card problem.   **6**

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T.Y. B.Sc. (Semester – III) Examination, 2009
ELECTRONIC SCIENCE (Paper – V)
EL-335 (E) : Electronics Equipments
Trouble Shooting and Repairs – I

Time : 2 Hours   Max. Marks : 40

N.B. :   i) *Answer **all** questions.*
            ii) *Draw neat diagrams **wherever** necessary.*
           iii) *Numbers to the **right** indicate **full** marks.*

1. Answer **all** of the following :

   a) How will you test capacitor using multimeter ?   **1**
   b) How will you identify leads of BJT using multimeter ?   **1**
   c) State the effect if switching transistor in SMPS is open.   **1**
   d) What is meant by shunt regulator ?   **1**
   e) State advantages of SMPS.   **2**
   f) What is fault if output of digital circuit is low ?   **2**
   g) State the fault if display on CRO is flickering.   **2**
   h) State the effect of mechanical vibration on trimmer capacitor.   **2**

2. Answer **any two** of the following :   **8**

   a) State and explain at least two possible faults in diode and transistor.
   b) Describe method to test efficiency and load regulation of transformer.
   c) Explain the functioning of over current and over load protection circuit.

3. Answer **any two** of the following :   **8**

   a) What are different faults in audio transformer ? State its causes.
   b) Describe procedure to test a transformer.
   c) Write steps to find faults in analog circuit.

4. Answer **any two** of the following :   **12**

   a) Discuss common faults in AF signal generator.
   b) Explain steps for trouble shooting and repair electronic instruments.
   c) Explain the role of CRO and multimeter in trouble shooting.

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T.Y.B.Sc. (Semester – III) Examination, 2009
ELECTRONIC SCIENCE (Paper – VI)
EL – 336 (A) : Computer Hardware – II (2004 Pattern)

Time: 2 Hours   Max. Marks: 40

*Note : i) **All** questions are **compulsory**.*
*ii) **Neat** diagrams must be drawn **wherever** necessary.*
*iii) Figures to the **right** indicate **full** marks.*

1. Answer **all** the following :
   a) List the type of DIMM packages.   **1**
   b) What do you mean by "Booting of the computer" ?   **1**
   c) State the purpose of I/O buses on mother board.   **1**
   d) List the two types of internal cache.   **1**
   e) "USB devices are hot pluggable". Comment.   **2**
   f) Write any four features of PCI local Bus.   **2**
   g) "The SCSI drives are better than IDE drives". Comment.   **2**
   h) List the types of HDD.   **2**

2. Attempt **any two** of the following :
   a) What is chipset ? Explain the functions of chipset in detail.   **4**
   b) With the help of neat block diagram, explain working of ON line UPS. **4**
   c) List all possible ports used on mother board. Explain them in brief. **4**

3. Attempt **any two** of the following :
   a) Explain the working of laser printer.   **4**
   b) What are the various reasons behind the failure of computer ? List the various
      Hardware tools used in computer hardware trouble shooting.   **4**
   c) Write a note on "Security preventives".   **4**

4. Attempt **any two** of the following :
   a) List the various semiconductor memories used in computer. Write down functions
      of them. Explain the role of virtual memory.   **6**
   b) What is scanner ? State its types. Explain working of any one of them. **6**
   c) What is operating system ? Write down different operating systems. Explain
      the following features with respect to operating system: multiprogramming,
      multitasking, multithreading and multiuser.   **6**

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ELECTRONIC SCIENCE (Paper – VI)
EL – 336 (B) : Computer Network Design and Maintenance – II

Time: 2 Hours   Max. Marks: 40

N.B. : i) *All* questions are *compulsory*.
   ii) *Draw neat diagram* **wherever** *necessary.*
   iii) *Figures to* **right** *indicate* **full** *marks.*

1. **All** Subquestions are **compulsory**.

   a) Up to what distance 10 BASE 2 can communicate ?   **1**

   b) What is logical topology ?   **1**

   c) What is ethernet ?   **1**

   d) Write the function of repeater.   **1**

   e) State the types of physical topology.   **2**

   f) State any two functions of TCP/IP protocol.   **2**

   g) Explain the difference between voice, video and data network.   **2**

   h) Write the various types cables in networking.   **2**

2. Attempt **any two** :

   a) Write a short note on fire safety.   **4**

   b) Explain source routing bridges.   **4**

   c) List the types of networks based on architecture. Explain them in brief. **4**

3. Attempt **any two** :

   a) Explain in brief network management protocol.   **4**

   b) List the various network connectivity devices. Explain any one in brief. **4**

   c) Compare star and bus topologies.   **4**

4. Attempt **any two**:

   a) Explain OSI model in brief, along with neat diagram.   **6**

   b) Explain the appropriate network and transport protocols for token ring network. **6**

   c) Explain the network administration plan to meet the needs of the growing networks, with reference to performance management, account management and security. **6**

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ELECTRONIC SCIENCE (Paper – VI)
EL – 336 (C) : Biomedical Instrumentation – II

Time: 2 Hours   Max. Marks: 40

N.B. : i) *All* questions are *compulsory*.
       ii) Draw *neat* diagrams *wherever* necessary.
       iii) Figures to the *right* indicate *full* marks.

1. **All** subquestions are **compulsory** :
   a) What are static characteristics of an instrument ? **1**
   b) List at least four sensors used for temperature measurement. **1**
   c) State the use of EEG. **1**
   d) What do you mean by non-polarizable electrode ? **1**
   e) State piezoelectric effect. For what purpose piezoelectric sensor is used ? **2**
   f) Electrodes are required for the measurement of biopotentials. Comment. **2**
   g) Sensor is the heart of biomedical instrumentation system. Comment. **2**
   h) What are different methods used for blood pressure measurement ? **2**

2. Attempt **any two** of the following :
   a) State the principle of radiation sensors. Explain any one in brief. **4**
   b) What is surface electrode ? State different types of body surface recording electrodes with appropriate application. **4**
   c) Explain the basic requirements of biopotential amplifiers in brief. **4**

3. Attempt **any two** of the following :
   a) State different basic blocks of cardiac monitor system and explain each in brief. **4**
   b) Explain with suitable diagram the ultrasonic flowmeter. **4**
   c) Explain with diagram the solidstate photoplethysmograph. **4**

4. Attempt **any two** of the following :
   a) Draw the block diagram of Biomedical Instrumentation system. Explain function of each. **6**
   b) Discuss the effect of kinetic energy in blood pressure measurement. **6**
   c) Sketch the block diagram of Electro-cardiogram and explain the function of each block. **6**

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ELECTRONIC SCIENCE (Paper – VI)
EL – 336 (D) : Electronic Instrumentation – II

Time: 2 Hours   Max. Marks: 40

*N.B. : i) **All** questions are **compulsory**.*
*ii) Draw **neat** diagrams **wherever** necessary.*
*iii) Figures to the **right** indicate **full** marks.*

1. **All** subquestions are **compulsory** :
   a) State any two types of standards.   **1**
   b) List different temperature sensors.   **1**
   c) State the working principle of strain gauge.   **1**
   d) Why calibration is needed in measuring instruments ?   **1**
   e) LVDT is used for measurement of displacement.Comment.   **2**
   f) LDR is active sensor. Comment.   **2**
   g) What are the essential parts of C.R.O. ?   **2**
   h) Define Accuracy and precision.   **2**

2. Attempt **any two** of the following :
   a) Explain the terms signal filtering and signal attenuation.   **4**
   b) Describe the working of bimetallic thermometer with suitable diagram. **4**
   c) Draw the block diagram of frequency analyzer and explain its working. **4**

3. Attempt **any two** of the following :
   a) Explain servotype potentiometric recorder.   **4**
   b) With neat diagram explain the working of LVDT.   **4**
   c) Describe electrical amplifying elements.   **4**

4. Attempt **any two** of the following :
   a) List various types of recording instruments. Explain any one in brief. **6**
   b) What are the different types of forced transduers ? Explain the working of pneumatic load cell. **6**
   c) Explain the functional elements of measuring system.   **6**

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ELECTRONIC SCIENCE (Paper – VI)
EL – 336 (E) : Agri-Electronics – II

Time: 2 Hours Max. Marks: 40

Note : i) **All** questions are **compulsory**.

ii) *Figures to the* **right** *indicate* **full** *marks.*

iii) *Draw* **neat** *diagrams* **wherever** *necessary.*

1. Attempt the following :

   a) What is need and scope of electronics in agriculture ? **1**

   b) How acidity of the soil is corrected ? **1**

   c) 'Harvesting is difficult during sprinkler irrigation'. Comment. **1**

   d) State basic physical principle of green house technology. **1**

   e) What is LVDT ? State its one application in agro-based industry. **2**

   f) What are various soil tests ? State its importance. **2**

   g) Compare sprinkler and drip irrigation system. **2**

   h) What are leaf parameters ? State their importance. **2**

2. Attempt **any two** of the following :

   a) Explain with diagram magnetically coupled float level indicator. **4**

   b) Explain soil thermometer. Discuss importance of it in agriculture. **4**

   c) What is drip irrigation system ? How it can be automated ? **4**

3. Attempt **any two** of the following :

   a) List the various errors in measurement system. Discuss methods to minimize the errors. **4**

   b) What are the instruments used in weather parameter measurements for agrometeorology ? Explain any one in brief. **4**

   c) How the soil moisture is measured ? Explain any one method in brief. **4**

4. Attempt **any two** of the following :

   a) What are the factors affecting growth of plants ? Discuss plant protection equipment used in agriculture. **6**

   b) What is the agrometerology ? Discuss use of agrometerology for long term planning. **6**

   c) What is green house ? Explain with circuit diagram temperature controller circuit useful in green house. **6**

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ELECTRONIC SCIENCE (Paper – VI)
EL – 336 (F) : Fiber Optics and Fiber Optic Communication – II

Time: 2 Hours   Max. Marks: 40

N.B. : *1)* ***All*** *questions are **compulsory**.*

2) *Figures to the **right** indicate **full** marks.*

3) *Draw **neat** diagrams **wherever** necessary.*

4) *Use of log table and calculator is **allowed**.*

1. Answer **all** of the following :

   a) Define the numerical aperture of an optical fiber.   **1**

   b) What is meant by graded index fiber ?   **1**

   c) State the different types of advanced optical fibers.   **1**

   d) State any two requirements of optical detector.   **1**

   e) Write the typical specifications of single mode fiber.   **2**

   f) Calculate the numerical aperture of an optical fiber, of its acceptance angle in air
      is 15°.   **2**

   g) Determine the overall signal attenuation in decibels through the fibers, when the
      mean optical power launched into an 8 km length of fiber is $120\mu\omega$ and the
      mean optical power at the fiber output is $3\mu\omega$. Assume there are no connectors
      or splices.   **2**

   h) Photo conductive gain in optical detector can only be obtained at the expense of
      maximum bandwidth permitted by the device. Comment.   **2**

2. Answer **any two** of the following :

   a) Explain how skew rays propagates through optical fibers.   **4**

   b) State the advantages and disadvantages of plastic fibers.   **4**

   c) Explain the operation of Edge emitter LED with suitable structure.   **4**

3. Answer **any two** of the following :

   a) Describe the bending losses in optical fibers.   **4**

   b) Explain the advantages of LED over LASER as a source in optical fiber communication.   **4**

   c) Derive an expression for the responsivity of photodetector in terms of the quantum efficiency of the device and the wavelength of the incident radiation.   **4**

4. Answer **any two** of the following :

   a) What are optical couplers ? Explain star and T couplers in optical fiber system.   **6**

   b) Draw the structure and explain the operation of LASER diode.   **6**

   c) Explain the intramodal and intermodal dispersion in optical fibers.   **6**

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T.Y. B.Sc. (Sem. – III) Examination, 2009
ENVIRONMENTAL SCIENCE
EN – 331 : Environmental Quality Management (Paper – I)
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Draw ***neat*** *and* ***labelled*** *diagrams* ***wherever*** *necessary.*
3) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Answer the following in **1-2** lines **each** :   **10**

   a) Define the term : Crop Rotation.

   b) What is Sustainable Agriculture ?

   c) Give any 2 principles of soil conservation.

   d) What is Slash and Burn agriculture ?

   e) What is Atmospheric inversion ?

   f) Give the difference between Gravimetric and Volumetric method.

   g) What is the principle of electrostatic precipitator ?

   h) What are the 3 basic elements of Green Revolution ?

   i) State the difference between Organic and Chemical fertilizer.

   j) Enlist any 4 types of Scrubbers.

2. Write short notes on **any two** of the following in **8-10** lines **each** :   **10**

   a) Traditional Agricultural systems.

   b) Mixing Height.

   c) Air Quality Standards.

3. Answer **any two** of the following in **8-10** lines.   **10**

   a) Describe Biofertilizers with reference to necessity and types.

   b) What is Stack Sampling ? Describe in detail.

   c) Describe Biofuels in detail.

4. Answer **any one** of the following in **20-22** lines :   **10**

   a) Describe in detail Gaussian Plume model with diagram.

   b) Describe in detail Green Revolution in India.

_____

T.Y. B.Sc. (Semester – III) Examination, 2009
ENVIRONMENTAL SCIENCE
EN-332 : Natural Resource Management (Paper – II)
(2004 Pattern)

Time : 2 Hours Max. Marks : 40

***Instructions : 1) All** questions are **compulsory**.*
*2) Draw **neat** and labelled diagrams **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*

1. Answer the following in **1-2** lines **each** : **10**

   a) Define ecosystem.

   b) Enlist any two major non-renewable natural resources.

   c) Mention any two importance of forest resources.

   d) What do you mean by soil/land degradation ?

   e) Define restoration.

   f) Enlist two major consequences of ecosystem exploitation.

   g) Write any two characteristics of aquatic ecosystem.

   h) What are aquifers ?

   i) Mention any two important functions of ecosystem.

   j) What are biofuels ?

2. Write short notes on **any two** of the following : **10**

   a) Soil Resources of India.

   b) Afforestation.

   c) Productivity of marine environment.

P.T.O.

3. Answer **any two** of the following : **10**

   a) What are mineral resources ? Add a note on its uses.

   b) Describe the process of ecorestoration briefly.

   c) Explain the role of mangroves in coastal ecosystem.

4. What are food resources ? Explain the world food problems and role of agriculture. **10**

                OR

   What is sustainable ecosystem management ? Describe the need for sustainable management of the ecosystems. **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
ENVIRONMENTAL SCIENCE
EN – 333 : Environmental Chemistry
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory.***
                     2) Neat diagrams must be drawn ***wherever*** *necessary.*
                     3) Black figures to the ***right*** *indicate* ***full*** *marks.*

1. Answer **all** questions in **1-2** lines each :   **10**

   a) What is the basis of calorimetric analysis ?

   b) Why integrated pest management approach has been introduced ?

   c) Write any two trace gases present in natural air.

   d) Enlist two nutrients responsible for eutrophication.

   e) What are modified detergents ?

   f) What is nitrification ?

   g) What are amino acids ?

   h) What is permissible limit of Hg and Zn in water ?

   i) What is the effect of nitrite on human body ?

   j) Give two names of species of microorganisms involved in nitrogen fixation.

2. Write short notes on **any two** of the following :   **10**

   a) PAN.

   b) Green Revolution.

   c) Modified detergents.

3. Answer **any two** of the following :   **10**

   a) Give an account of toxic chemicals present in soil.

   b) Explain how nitrogen in the atmosphere enters into organisms through nitrogen cycle.

   c) Write a note on minerals.

4. Answer **any one** of the following :   **10**

   a) Describe major nutritional categories with reference to proteins, vitamins, fats and carbohydrates.

   b) Explain with suitable diagram the principle of AAS.

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T.Y. B.Sc. (Semester – III) Examination, 2009
ENVIRONMENTAL SCIENCE
EN 334 : Environmental Management
(2004 Pattern)

Time : 2 Hours   Total Marks : 40

Instructions *: 1)* **Neat** *diagrams must be drawn* **wherever** *necessary.*
2) **All** *questions carry* **equal** *marks.*
3) **All** *questions are* **compulsory**.

1. Attempt the following in **1-2** lines **each** :   **10**

   a) Define EIA.

   b) What is PDCA cycle ?

   c) Mention the law meant for wildlife conservation.

   d) Name the environmental activist associated with Chipko movement.

   e) What do you mean by mitigation ?

   f) Define convention.

   g) Name the international convention on wetlands.

   h) Write any two phases mentioned in Montreal protocol for phase cut programme.

   i) Mention any two significances of environmental laws.

   j) Note any two structural elements of EMS.

2. Write notes on **any two** of the following.   **10**

   a) Objectives of ISO 14000

   b) Steps of EIA

   c) Silent Valley Project.

3. Answer **any two** from the following. **10**

   a) Discuss the significance of documentation in ISO 14000.

   b) Elaborate the significance of social contribution in EIA.

   c) What are different merits of being party to the international convention ?

4. Explain the environmental and social concerns of Narmada Bachao Movement. **10**

   OR

   Discuss the merits and limitations of Environment (Protection) Act, 1986.

   _____

T.Y. B.Sc. (Semester – III) Examination, 2009
ENVIRONMENTAL SCIENCE
EN 335 : Environmental Geoscience
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions :   *1)* ***All*** *questions are* ***compulsory****.*
                                 2) ***All*** *questions carry* ***equal*** *marks.*
                                 3) Neat diagrams must be drawn ***wherever*** *necessary.*

1. Attempt the following in **1-2** lines each :   **10**
    a) Define the term biosphere.
    b) What are fossil fuels ?
    c) Name the two plants used as petro-crops.
    d) Give any two types of nuclear reactors.
    e) Give the composition of coal.
    f) What is compressed natural gas ?
    g) Define cyclone.
    h) Mention any two types of coal.
    i) What is albedo ?
    j) Differentiate between cold and warm anticyclone.

2. Write notes on (**any two**) :   **10**
    a) Tropical cyclone
    b) Nuclear energy
    c) Energy conservation.

3. Attempt **any two** from the following :   **10**
    a) Discuss the potential of hydrogen as a fuel.
    b) Explain the conservation of matter in various Geosystems.
    c) Write about the biomass as energy source.

4. Describe in detail 'Earth's Thermal Environment' !.   **10**
                            OR
    Why there is a need to go for Renewable energy resources ? Support your answer
    with the appropriate examples.

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T.Y. B.Sc. (Semester – III) Examination, 2009
ENVIRONMENTAL SCIENCE
EN – 336 : Applied Biology
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) ***All*** *questions carry* ***equal*** *marks.*
3) Neat diagrams must be drawn ***wherever*** *necessary.*

1. Attempt the following in **1-2** lines **each** :

   a) Enlist types of bioremediation.

   b) Define environmental protection.

   c) Give two names of microbes used in environmental protection.

   d) What is population interaction ?

   e) Define prey-predator relationship.

   f) What is industrial microbiology ?

   g) Give the scientific name of a microbe used in the production of SCP.

   h) Define environmental microbiology.

   i) Define bioreactor.

   j) Give a name of a microbe used in biosensor.

2. Write short notes on **any two** of the following :

   a) Microbial biomass.

   b) Role of microbes in ecosystem.

   c) Biomolecules in enzyme sensors.

3. Attempt **any two** of the following :

  a) Describe microbial prey-predator relationships in any ecosystem.

  b) What is the role of biotechnology in environmental protection ?

  c) What is the role and importance of microbes in the treatment of waste water ?

4. a) What is bioremediation ? Give a detail account of bioremediation technologies with suitable examples. Add a note on the microbes used in bioremediation.

                    OR

  a) Write a detail account on microbial community profiling. Add a note on microbial populations in disturbed environment.

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T.Y. B.Sc. (Semester – III) Examination, 2009
INDUSTRIAL CHEMISTRY (Paper – V)
VOC-IND-CH 335 : Inorganic and Organic Based Industries – I
(2004 Pattern)

Time : 2 Hours Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory.***
2) *Figures to the* ***right*** *indicate* ***full*** *marks.*
3) *Draw* ***neat*** *diagrams* ***wherever*** *necessary.*

1. Answer the following questions : **10**

   1) Name the catalysts used in contact process.

   2) What are the constituents of paints ?

   3) How is ammonia converted to nitric oxide ?

   4) Define Brix unit of measurement.

   5) Give names of nitrogenous fertilizer.

   6) Define the term 'Space velocity'.

   7) What is vinegar ?

   8) What is valcanisation ?

   9) Define term process control.

   10) What is denatured spirit ?

2. A) Attempt **any two** of the following : **6**

   1) Describe any two methods of estimation of sugar.

   2) Distinguish between batch and continuous process.

   3) What are rodenticide and fungicides ? Explain with examples.

P.T.O.

B) Attempt **any two** of the following : **4**
1) Explain addition polymerisation with two examples.
2) What are mixed fertilizers ?
3) Give the essential requirements of fermentation.

3. Write short notes on **any two** of the following : **10**

1) By products of sugar industry.

2) Refined sugar manufacture from raw sugar.

3) Fumigants and repellants.

4. A) Describe the manufacture of alcohol from molasses. **6**

OR

A) Manufacture of urea with a neat flow sheet. **6**

B) Attempt **any one** of the following : **4**
1) Catalyst used in contact process
2) Write a note on paint removers.

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T.Y. B.Sc. (Semester – III) Examination, 2009
BIOTECHNOLOGY (Vocational)
BT-335 : Plant Biotechnology (Paper – V)
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

*Instructions : 1) **All** questions are **compulsory**.*
*2) Draw **neat** diagrams.*
*3) **All** questions carry **equal** marks.*

1. Answer the following :   **10**

   a) What are cybrids ?

   b) Define haploids.

   c) Give two functions of auxins in plant tissue culture.

   d) What is subculturing ?

   e) Enlist two chemicals that are used as cytokinins.

   f) Define explant.

   g) What is organogenesis ?

   h) Give the significance of triploid production.

   i) What are the markers used for selection of hybrid cell ?

   j) What material is used for genetic manipulation of plants ?

2. Answer **any two** of the following : 10

   a) What is somatic embryogenesis ? Describe the stages and factors affecting somatic embryo formation.

   b) What is embryo rescue after wide hybridization ? Give its applications.

   c) Mention various steps in the regeneration of protoplast.

3. Write notes on **any two** of the following : 10

   a) Shoot tip and meristem cultures.

   b) Tumor formation in plants.

   c) Beginning of in vitro cultures in India.

4. What are single cell suspension cultures ? How are they used for selection of varient/mutant ? Explain. 10

                   OR

   What are the different methods of sterilization used in PTC laboratory ? Describe any four methods. 10

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T.Y. B.Sc. (Semester – III) (2004 Pattern) Examination, 2009
STILL PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION
(Vocational)
Paper – V : Fundamentals of Communication and Propagation

Time : 2 Hours   Max. Marks : 40

Instructions: 1) **All** *questions carry* **equal** *marks.*
2) *Give suitable examples* **wherever** *necessary.*
3) *Figures to the* **right** *indicate* **full** *marks.*

1. Attempt following short answer questions.   **(2×8=16)**

   1) The amplitude of the carrier signal of a wave after amplitude modulation varies between 4V and 1V. Calculate the depth of modulation.

   2) Consider the analog signal $x(t) = 2\sin 50\pi t + 5\sin 500\pi t - \cos 100\pi t$, Find maximum frequency present in x(t) and Niquist rate for this signal.

   3) Prove that total power of AM wave (P_t) is 3/2 times carrier power (P_c), for maximum value of modulation index.

   4) What is a Vestigial band ? Explain with the help of waveform.

   5) Why non linear devices are used for amplitude modulation ?

   6) Comment on the range of modulation index for amplitude modulation.

   7) A loss free transmission line has distributed inductance of 1 mH/km and characteristic impedance (Z_0) of 154.9Ω. Calculate its capacitance.

   8) A carrier wave is represented by E_c = 10 sinwt. Draw the wave form if this wave is amplitude modulated with the modulation index of 0.5.

2. Attempt **any two** of the following :   **(2×4=8)**

   A) What is sampling ? Explain it with the help of diagram.

   B) Explain phase shift method for SSB generation.

   C) The output voltage of a transmitter is 500(1 + 0.4 sin 3140t) sin 6.28×10^{7}t. Find the power of the carrier signal and the mean output power.

P.T.O.

3. Attempt **any two** of the following : **(2×4=8)**

   A) Write a short note on transmission lines.

   B) List the different types of analog pulse modulation and draw the appropriate waveforms.

   C) A FM wave is represented by $V = 10 \sin (5 \times 10^8 + 4 \sin (250t))$. Find 1) Carrier frequency 2) Modulating frequency 3) Modulation index and 4) Power dissipated by this wave in an antenna of $5\,\Omega$ resistance.

4. Attempt **any two** of the following : **(2×4=8)**

   A) Derive an expression for amplitude modulated wave. Identify the lower side band, the upper side band and the carrier signals.

   B) Draw block diagram and explain digital communication system.

   C) A television signal with a bandwidth of 4.2 MHz is transmitted using binary PCM. The number of quantization level is 512. Find the codeword length, transmission bandwidth, final bit rate and output signal to noise (S/N) ratio.

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T.Y. B.Sc. (Semester – III) Examination, 2009
ELECTRONICS EQUIPMENTS AND MAINTENANCE – V
(Paper – V) (Vocational)
EEM-335 : Troubleshooting and Repairs
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions : 1) **All** *questions are* **compulsory**.
                     2) Figures to the **right** *indicate* **full** *marks.*
                     3) **Use** *of log table, calculator is* **allowed**.

1. Answer the following :   **(3×4=12)**

   a) Answer the following :   **(4×1=4)**

      i) Why are high value wire wound resistors more likely to become open circuit ?

      ii) Why do capacitors become 'partially short' ?

      iii) What is meant by test vector ?

      iv) Explain the cause of the fault 'logic gate stuck at 1'.

   b) Answer the following :   **(2×2=4)**

      i) Explain how to test an electrolytic capacitor using an ohm meter.

      ii) How many checks are required for a system containing 10 stages using split-half method ?

   c) Comment on the following statements :   **(2×2=4)**

      i) Inductance is a wattless component.

      ii) A delay line is used in CRO.

2. Answer **any two** of the following :   **(2×4=8)**

   a) Explain following in case of a transformer

      i) Impedance matching   ii) Load regulation

      iii) Efficiency   iv) Losses

   b) Discuss typical faults in capacitors and their causes.

   c) How is a fault located in convergent and divergent circuits ?

                                                                                  P.T.O.

3. Answer **any two** of the following : (2×4=8)

   a) Explain procedure for troubleshooting a power supply.

   b) Explain the typical faults in an op-amp and their causes.

   c) Give typical faults in digital circuits and their causes.

4. Answer the following : (2×6=12)

   a) Give a block diagram of CRO. Explain the working of 'intensity' and 'level' controls in CRO. What is the cause of following fault ?

   – No light on screen.

   b) Give a block diagram of DMM and explain typical faults in it.

   OR

4. Answer the following : (3×4=12)

   a) Give the expressions for finding line and load regulation. For a voltage regulator, open circuit output is 10 V and that at full load current is 9.5 volt. Find its % load regulation.

   b) Explain the cause of following faults in a RC – coupled CE amplifier.

      i) Voltage at the collector is too low.

      ii) Collector voltage is equal to V_{cc}.

   c) Use the truth table method to find test vectors for different faults in an AND gate with 3 inputs. (Lines 1, 2 and 3 are inputs and line 4 is output)

   _____

T.Y. B.Sc. (Semester – III) Examination, 2009
INDUSTRIAL MICROBIOLOGY (Paper – V)
VOC-IND-MIC-335 : Pollution Control Technology
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory.***
                                2) ***All*** *questions carry* ***equal*** *marks.*
                                3) *Assume suitable* ***data,*** *if necessary.*
                                4) *Neat diagrams must be drawn* ***wherever*** *necessary.*
                                5) *Black figures to the* ***right*** *indicate* ***full*** *marks.*
                                6) *Use of logarithmic tables, slide rule, Mollier charts,*
                                     electronic pocket calculator and steam tables is ***allowed.***

1. Answer as directed :   **10**

   A) Define the following :

     Biosorption

   B) Choose the correct answer :

     i) BOD is measure of _____ used by microorganisms for biological oxygen demand.

       i) Volatile oxygen   ii) Dissolved carbon

       iii) Volatile carbon   iv) Dissolved oxygen

     ii) The sewage treatment unit, which works on anaerobic decomposition of organic matter is _____

       i) Septic tank   ii) Oxidation pond

       iii) Grit chamber   iv) Activated sludge

     iii) Longer exposure to nitrous oxide even in small concentration may cause disease pertaining to

       i) Liver   ii) Lung   iii) Kidney   iv) Heart

   C) Give any two objectives of waste water treatment.

   D) Name any two chemicals used for coagulation of solids.

   E) What is mean by waste water composition ?

   F) State limitations of BOD analysis.

   G) State true or false.

     The primary purpose of anaerobic digestion is stabilization of sludge

   H) Name the institution in Maharashtra that regulates pollution norms.

2. Answer **any two** of the following :   **10**

   i) Justify the composition of waste water is diverse.

   ii) Describe various disinfection processes used in waste water treatment.

   iii) Describe the design of septic tanks.

3. Answer **any two** of the following :   **10**

   i) Write short note on Trouble Shooting in ETP.

   ii) Write short note on different types of solids present in waste water.

   iii) State and explain the need for Environment Impact Assessment.

4. Describe the design and working of oxidation lagoon.

                           OR

   Determine the size of high rate tricking filter for the following data   **10**

       Flow = 4.5 M/d

       Recirculation ratio = 1.5

       BOD of raw waste = 230 mg/L

       Final BOD desired for effluent = 30 mg/L.

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T.Y.B.Sc. (Semester – III) Examination, 2009
COMPUTER MAINTENANCE (Vocational) (Paper – V)
Computer Service Management
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

1. Answer in **one/two** sentences : **(10×1=10)**

   a) List different operating system.

   b) What is bit size of FAT 32 ?

   c) Describe minimum requirement of HD.

   d) List any two peripherals that can be interfaced at USB port.

   e) How hard disk are detected ?

   f) What is Codec ?

   g) Which Dos file is used for Booting ?

   h) Which FAT system used in Win 98 ?

   i) Which type of communication used in USB ?

   j) What is data transfer rate of 56K modem ?

2. Answer **any two** of the following : **(2×5=10)**

   a) Compare features of Windows 2000 and 98 operating system.

   b) What type of recording medium used in Hard Disk and explain in detail.

   c) Explain various steps involved in trouble shooting MODEM.

3. Answer **any two** of the following : **(2×5=10)**

   a) Discuss NTFS with reference to Win 2000.

   b) Explain different parts of HDD.

   c) Write a short note on display unit of portable system.

4. Answer **any one** of the following : **(1×10=10)**

   a) What is USB ? State and explain any four application of it with interface standards.

   b) What is TU Tuner Card ? Explain its components with suitable diagram.

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T.Y. B.Sc. (Semester – III) Examination, 2009
Paper – V : SEED TECHNOLOGY (Vocational)
Seed Pathology
(2004 Pattern)

Time : 2 Hours   Marks : 40

Instructions : 1) **All** questions are **compulsory**.
　　　　　　　 2) **Draw** neat and labelled diagrams **wherever** necessary.
　　　　　　　 3) Figures to the **right** indicate **full** marks.

1. Answer the following :   (10×1=10)

   a) What are seed borne diseases ?

   b) What are storage fungi ?

   c) Define seed transmission.

   d) Give the name of causal organism responsible for Tikka disease in ground nut.

   e) Give the importance of seed treatment.

   f) Give any two objectives of seed quarantine.

   g) Enlist any two methods employed in seed health testing.

   h) What is seed act ?

   i) Give the name of nematode which causes ear cockle disease in wheat.

   j) Write the importance of seed pelleting.

2. Attempt **any two** of the following :   (2×5=10)

   a) Give an account of any two diseases caused by seed borne bacteria.

   b) Explain the mechanism of seed transmission.

   c) What are the objectives of seed health testing ?

P.T.O.

3. Write short notes on **any two** of the following :   (2×5=10)

   a) Entry point of seed infection.

   b) Seed certification.

   c) National co-operation in seed pathology.

4. Explain in detail the management of crop for production of pathogen free seeds.   **10**

                         OR

   Describe the methods employed in seed treatment.   **10**

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T.Y. B.Sc. (Sem. – III) Examination, 2009
INDUSTRIAL CHEMISTRY (Paper – VI)
VOC-IND-CH-336 : Industrial Methods of Chemical Analysis – I
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
2) Figures to the **right** indicate **full** marks.
3) **Neat** diagrams must be drawn **wherever** necessary.
4) Use of Calculator/Logarithmic table is **allowed**.
5) Assume **suitable** additional data **if necessary**.

1. Answer precisely the following :   **(10)**

   a) Differentiate between gross sample, sample and analysis sample.

   b) Give two examples of determinate errors.

   c) Define the term 'retention volume' as used in chromatography.

   d) Name the stationary phase materials used in TLC.

   e) What is gradient elution ?

   f) Name the detectors used in GC.

   g) Which radiation source is used in uv spectroscopy for getting intense radiation ?

   h) What are the essential elements of a monochromator ?

   i) Define Larmor frequency.

   j) What is the unit of wave number ?

2. A) Answer the following **(any two)** :   **6**

   a) Describe three methods for minimization of determinate errors.

   b) Give the wavelength range in μ m, of near IR, mid IR and far IR region of an electromagnetic spectrum.

   c) Describe the 'quartering method' for sampling of solid materials.

P.T.O.

B) Answer briefly the following **(any two)** :   **4**

    a) Explain the term, 'eddy diffusion'.

    b) Differentiate between accuracy and precision with examples.

    c) An eight-dynode PM tube has an amplification factor of 6.9×10^6. Calculate the average number of electrons that are emitted at each dynode.

3. Answer the following **(any two)** :   **10**

    a) Draw a neat labelled diagram of an HPLC apparatus and state the advantages of HPLC over GC.

    b) Describe with a neat sketch, the construction and working of a photo cell detector.

    c) A sample is analyzed by titration with standard acid. The analysis is performed in triplicate with the following results :

        93.50, 93.58 and 93.43% carbonate. Within what range are you 95% confidence that the true value lies ? At 95% confidence level and two degrees of freedom, t = 4.303.

4. A) Describe with a neat sketch, the photometric detector used in HPLC. State its advantages.   **6**

            OR

  A) Explain the chemical shift observed in NMR spectroscopy.   **6**

  B) Solve **any one** of the following :   **4**

    a) For a gas chromatographic column, the values for A, B and C in the van Deemter equation were 0.060 cm, 0.57 sq.cm/s and 0.13s. Calculate the minimum plate height and the best flow rate.

    b) What will be the chemical shift of a particular nucleus in 60 MHz instrument if the reference nucleus absorbs at a magnetic flux density that is 0.086 Gauss (G) greater than that at which the sample nucleus absorbs ?

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T.Y. B.Sc. (Semester – III) Examination, 2009
BIOTECHNOLOGY (Vocational)
(Paper – VI) (2004 Pattern)
BT-336 : Environmental Biotechnology and Entrepreneurship

Time : 2 Hours   Max. Marks : 40

1. Answer the following :   **10**

   a) Name any two conventional fuels

   b) What is presumptive test ?

   c) What are biofertilizers ?

   d) Define petroplants.

   e) Give the significance of gasohol experiment.

   f) How is hydrogen advantageous as a fuel ?

   g) Define the term Entrepreneur.

   h) What is the full form of SICOM ?

   i) Name one market survey technique.

   j) What do you mean by communication ?

2. Answer **any two** of the following :   **10**

   a) How activated sludge treatment is carried out ?

   b) What is biological control ? Explain with suitable example.

   c) Describe two test to check the microbial quality of food.

3. Attempt **any two** of the following : **10**

   a) What are the characteristics of an entrepreneur ? Explain in details.

   b) Write a note on MIDC.

   c) Explain about Co-operative Society.

4. What are the different designs of digesters for biogas ? Explain with diagrams. **10**

                    OR

   How does the symbiotic nitrogen fixation takes place ? Discuss with schematic diagram. **10**

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T.Y. B.Sc. (Semester – III) Examination, 2009
(2004 Pattern)
STILL PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION
(Vocational)
Paper – VI : Television Software

Time : 2 Hours   Max. Marks : 40

Instructions : 1) *Attempt* **all** *questions.*
                 2) *Draw* **neat** *and labeled diagrams* **wherever** *necessary.*
                 3) *Figures to the* **right** *indicate* **full** *marks.*

1. Answer the following.   **10**
   a) What do you understand by the term 'shot' ? Explain.
   b) What do you understand by 'transitions' with reference to the shot ? Explain.
   c) Explain the concept of Point of View shot.
   d) Explain the difference between a feature film and a short film.
   e) What do you understand by 'Line of Action' ? Explain.

2. Answer **any two** of the following.   **10**
   a) Explain different types of shot.
   b) Explain what do you understand by alteration of time and space.
   c) Describe various camera movements and explain where they are used.

3. Write a script for 30 sec social advertisement on the following theme in **drama format**.   **10**
   "Neutral attitude of people towards voting in assembly elections"

                              OR

3. Write a script for 30 sec social advertisement on the following theme in **documentary format**.   **10**
   "Neutral attitude of people towards voting in assembly elections"

4. Write short notes on **any two** :   **10**
   a) Steps involved in production process
   b) Importance of storyboarding
   c) Importance of continuity

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T.Y. B.Sc. (Semester – III) Examination, 2009
ELECTRONIC EQUIPMENT AND MAINTENANCE – VI (2004 Pattern)
(Vocational) (Paper – VI)
EEM – 336 : Electronic Instrumentation

Time : 2 Hours   Max. Marks : 40

Instructions : 1) *All questions are compulsory.*
  2) *Figures to the right indicate full marks.*
  3) *Use of log table/calculator is allowed.*

1. Answer the following :

A) Attempt the following :   **(4×1=4)**

   a) What do you mean by the calibration of the instrument ?

   b) State the functional elements of measurement system.

   c) What do you mean by thermocouple ?

   d) Define dynamometer.

B) Solve the following :   **(2×2=4)**

   a) If the measured value by dc voltmeter is 9.9 V. But the true value is 10 V. Find the accuracy of dc voltmeter.

   b) A capacitance type transducer has two plates of area 1 cm² each, separated by an air gap of 1 mm thickness. Find the value of capacitance.

C) Comment on the following :   **(2×2=4)**

   a) Accuracy of voltmeter depends on its internal resistance.

   b) Digital indicating devices are preferred over the analog one.

2. Answer **any two** of the following :   **(2×4=8)**

   a) Explain with neat diagram the working principle of relative motion measuring device.

   b) Explain the principle of hydraulic load cell.

   c) Write a short note on 'International Temperature Scale'.

P.T.O.

3. Answer **any two** of the following : **(2×4=8)**

   a) Explain one of the techniques used for the measurement of high pressure.

   b) Write a short note on primary or quantity meter.

   c) Describe with a neat diagram a typical sound measurement system.

4. Answer the following : **(2×6=12)**

   a) Explain the working of magnetic tape recorder with suitable block diagram.

   b) Explain the static performance characteristics of electronic instrument.

                     OR

4. Solve the following : **(2×6=12)**

   a) In some Seismic equipment, spring stiffness = 2 N/mm, mass = 100 gms, damping ratio = 0.8. Find the amplitude of recorded motion if the motion to be measured is 4 sin 200t (mm).

   b) For a certain thermistor, $\beta = 3140 \, k$ and the resistance at 30°C is known to be 1000Ω. The thermistor is used for temperature measurement and the resistance measured is 2000Ω. Find the corresponding measured temperature.

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T.Y. B.Sc. (Semester – III) Examination, 2009
INDUSTRIAL MICROBIOLOGY (Paper – VI)
VOC-IND-MIC-336 : Animal and Plant Tissue Culture
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

Instructions :   *1)* **All** *questions are* **compulsory**.
                   2) **All** *questions carry* **equal** *marks.*
                   3) *Assume suitable data,* **if** *necessary.*
                   4) *Black figures to the* **right** *indicate* **full** *marks.*
                   5) *Neat diagrams must be drawn* **wherever** *necessary.*
                   6) **Use** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* **allowed**.

1. Answer as directed :   **10**

   A) Choose the right answer :
      i) Protoplasts can be generated by enzymatic treatment using enzyme.
         a) Cellulase and proteases   b) Cellulase and pectinase
         c) Cellulase and amylase   d) Pectinase and protease
      ii) Vero cell line is prepared from
         a) Plants   b) Human
         c) Mouse   d) Monkey
      iii) Cell-cell adhesion molecules are independent at _____ ions.
         a) Calcium   b) Magnesium
         c) PEG   d) Cadherins

   B) State True / False :
      i) Electroporation can be used to introduce exogenous DNA into cells.
      ii) Colchicine treatment produces diploid cells in pollen culture through the process of meiotic arrest.

   C) Define the following :
      i) Gene Therapy   ii) Micropropagation.

                                                                                            P.T.O.

D) Give any two examples of continuous cell lines.

E) What are interferons ?

F) State the purpose of trypsinisation of tissue.

2. Write short notes on **any two** :   **10**

   i) Embryo culture

   ii) Somatic embryogenesis

   iii) Application of transgenic plants.

3. Answer **any two** of the following :   **10**

   i) What is "In Vitro Fertilization" ?

   ii) How are dye exclusion and dye uptake tests used for cytotoxicity testing ?

   iii) Importance of transgenic animals.

4. Comment on-Dolly, the transgenic clone.

                OR

Describe chemo fusion method of Protoplast fusion. Comment on hybrids and cybrids and their application.   **10**

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T.Y.B.Sc. (Semester–III) Examination, 2009
(Vocational)
COMPUTER MAINTENANCE (Paper–VI)
EL–336 : Computer Network Design and Maintenance
(2004 Pattern)

Time : 2 Hours   Max. Marks : 40

1. Answer the following in **one**/**two** sentences :   **(1×10=10)**

   a) Define topology of network.

   b) Classify types of Network.

   c) For higher bandwidth the co-axial cable is not recommended comment.

   d) What is balanced wiring ?

   e) What is protocol ?

   f) Classify the network expansion devices.

   g) Define datagram.

   h) State any two factors involved in power estimation.

   i) Which network is used to connect computers within the range of 1 k.m ?

   j) What do you mean by Network Architecture ?

2. Answer **any two** of the following :   **(5×2=10)**

   a) Discuss Base band and broad band networks in detail.

   b) Explain various signal characteristics.

   c) List various power protection devices and explain any one in detail.

3. Answer **any two** of the following : **(5×2=10)**

   a) List different categories of network with one application for each.

   b) Explain Frame Filtering process in Bridge.

   c) What is multimedia ? List minimum hardware requirements.

4. Answer **any one** of the following : **(10×1=10)**

   a) List various types of cables used in computer network. Explain any two in brief.

   b) Differentiate the following :

   i) HUB and Bridge

   ii) Router-Switch.

   iii) On-line UPS and Off line UPS.

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T.Y. B.Sc. (Semester – III) Examination, 2009
SEED TECHNOLOGY (Vocational)
Seed processing and Storage (Paper – VI)
(2004 Pattern)

Time: 2 Hours   Max. Marks: 40

Instructions : 1) ***All*** questions are ***compulsory***.
                            2) ***Draw*** neat and labelled diagrams ***wherever*** necessary.
                            3) Figures to the ***right*** indicate ***full*** marks.

1. Answer the following :   **(10×1=10)**

    a) Give any two significant aspects of seed processing in the pathway of seed improvement.

    b) What is the scalper ?

    c) Define seed drying.

    d) Enlist various types of seed separating equipments.

    e) What is stratification ?

    f) Enlist parts of mist-o-matic seed treater.

    g) What is a lot number ?

    h) Give any two uses of seed records.

    i) What is seed labelling ?

    j) Define seed moisture.

2. Attempt **any two** of the following :   **(2×5=10)**

    a) Explain in detail methods of seed drying.

    b) Describe construction and operation of indented disc separator.

    c) Explain separation problems and their rectification related to specific gravity separator.

3. Write short notes on **any two** :   **(2×5=10)**

   a) Machine operators and seed user safety.

   b) Belt conveyors.

   c) Labelling and maintaining of lot identity.

4. Explain in detail construction and operation of mechanical drying equipments and add a note on dehumidification.   **10**

                              OR

4. Explain construction of seed storage structure with respect to moisture and heat proofing. Add a note on seed storage management.   **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
MATHEMATICS (Paper – I)
MT-341 : Complex Analysis

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* ***All*** *questions are* ***compulsory****.*
          2) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Attempt **each** of the following :   **10**

   i) State Cauchy-Goursat theorem.

   ii) Represent the function $f(z) = \dfrac{z+1}{z-1}$ by its Maclaurin series; and give the region
       of validity for the representation.

   iii) State C.R. equations in polar form.

   iv) Using sufficient condition for differentiability, show that $f(z) = 3x + y + i(3y - x)$
       is entire.

   v) Justify whether the following statement is true or false. 'For every complex
       number z, $|\cos z| \leq 1$'.

   vi) Show that $u(x, y) = 2x - x^3 + 3xy^2$ is harmonic.

   vii) Find the principal value of i^i.

   viii) Find $\underset{z=i}{\mathrm{Res}} \dfrac{1}{z^2 + 1}$.

   ix) State the fundamental theorem of algebra.

   x) Show that the transformation $W = i_z + i$ maps the half plane x > 0 onto the half
       plane V > 1.

2. Attempt **any two** of the following : 10

   i) a) Show that $\sin(\bar{z})$ is not an analytic function of z everywhere.

   b) Show that $\cosh(z + \pi i) = -\cosh z$.

   ii) Suppose that $f(z) = u(x, y) + iv(x, y)$, $z_0 = x_0 + iy_0$ and $w_0 = u_0 + iv_0$. Then prove that $\lim\limits_{z \to z_0} f(z) = w_0$ if and only if

   $$\lim\limits_{(x,y) \to (x_0, y_0)} u(x, y) = u_0 \text{ and } \lim\limits_{(x,y) \to (x_0, y_0)} V(x, y) = v_0.$$

   iii) Let u and v denote real and imaginary components of the function f defined by

   $$f(z) = \begin{cases} \dfrac{(\bar{z})^2}{z} & \text{when} \quad z \neq 0. \\ 0 & \text{when} \quad z = 0. \end{cases}$$

   verify that the C.R. equations are satisfied at the origin. Also show that $f'(0)$ does not exist.

3. Attempt **any two** of the following : 10

   i) State and prove Morera's theorem.

   ii) Find the linear fractional transformation which maps the points $z_1 = -1$, $z_2 = 0$ and $z_3 = 1$ on to the points $w_1 = -i$, $w_2 = 1$ and $w_3 = i$ respectively.

   iii) If f (z) is defined by the equations

   $$f(z) = \begin{cases} 1 & \text{when} \quad y < 0, \\ 4y & \text{when} \quad y > 0 \end{cases}$$

   and if C is the arc from $z = -i - 1$ to $z = i + 1$ along the curve $y = x^3$, then evaluate $\int_c f(z)\, dz$.

4. Attempt **any one** of the following : **10**

   i) If a function f is analytic at a point, then prove that its derivatives of all orders are also analytic functions at that point.

   ii) a) State and prove Cauchy's residue theorem.

      b) State Laurent's theorem. Find the Laurent series that represents the function

$$f(z) = \frac{e^z}{(z+1)^2} \text{ in the domain } 0 < |z + 1| < \infty.$$

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T.Y. B.Sc. (Semester – IV) Examination, 2009
MATHEMATICS (Paper – II)
MT – 342 : Real Analysis – II

Time: 2 Hours   Max. Marks: 40

N.B. : *i)* **All** *questions are* **compulsory**.
        ii) *Figures to the* **right** *indicate* **full** *marks*.

1. Attempt **each** of the following :   **10**

   i) Show that the integral $\int_0^1 \dfrac{\sin x}{x^{3/2}} dx$ is convergent.

   ii) Using definition, show that $\int_1^\infty \dfrac{1}{\sqrt{x}} dx$ is divergent.

   iii) Find C.P.V. of $\int_{-\infty}^{\infty} x\, dx$.

   iv) For $n \in I$, let $f_n(x) = nx(1-x^2)^n, x \in [0,1]$ show that $\left\{ \int_0^1 f_n \right\}_{n=1}^{\infty}$ converges to $\dfrac{1}{2}$.

   v) Find the limit function of the sequence $\{f_n(x)\}_{n=1}^{\infty}$ where $f_n(x) = \dfrac{x}{n} e^{\frac{-x}{n}}$ $(0 \le x < \infty)$.

   vi) Prove that $\sum_{n=1}^{\infty} \dfrac{1}{n^2 + x^2}$ is uniformly convergent on $[0, \infty]$.

   vii) Find the sum function of the series $\sum_{n=0}^{\infty} \dfrac{x}{(1+x)^n}$.

   viii) State the conditions under which the series $\sum_{n=1}^{\infty} u_n(x)$ can be differentiated term by term.

   ix) Find Bernstein polynomial B_2 for $f(x) = x, x \in [0, 1]$.

   x) If $I(a) = \int_0^{\pi/2} \log(a\cos^2 \theta + b\sin^2 \theta)d\theta$, find $I'(a)$.

2. Attempt **any two** of the following : **10**

   i) If $\int\limits_{a}^{\infty}f(x)dx$ converges absolutely then prove that $\int\limits_{a}^{\infty}f(x)dx$ converges.

   ii) If f is continuous on [0, 1] then prove that $\int\limits_{0}^{1}\dfrac{f(x)}{\sqrt{1-x^2}}dx$ is convergent. Further

   prove that $\int\limits_{0}^{1}\dfrac{f(x)}{\sqrt{1-x^2}}dx = \int\limits_{0}^{\pi/2}f(\sin u)du$.

   iii) Discuss the convergence of $\int\limits_{0}^{\infty}\dfrac{1+x}{1+x^2}dx$.

3. Attempt **any two** of the following : **10**

   i) If $\{f_n\}_{n=1}^{\infty}$ is sequence of Riemann integrable functions on [a, b] which converges uniformly to the function f on [a, b] then prove that 'f' is Riemann integrable on

   [a, b] and $\lim\limits_{n\to\infty}\int\limits_{a}^{b}f_n(x)\,dx = \int\limits_{a}^{b}f(x)dx$.

   ii) By examining $f(x) = \lim\limits_{n\to\infty}f_n(x)$ for $0 \le x < \infty$, where $f_n(x) = \dfrac{1}{1+x^n}$, prove that

   $\{f_n\}_{n=1}^{\infty}$ does not converge uniformly on [0, ∞).

   iii) Show that series $\sum\limits_{n=1}^{\infty}\dfrac{x}{n(1+nx^2)}$ converges uniformly for all $x \in R$.

4. Attempt **any one** of the following : **10**

i) a) Let $\displaystyle\sum_{k=1}^{\infty} U_k$ be series of real valued functions on a set E. If there exists positive

numbers $M_1, M_2, M_3, \ldots$ with $\displaystyle\sum_{k=1}^{\infty} M_k < \infty$ such that $\displaystyle\sum_{k=1}^{\infty} U_k(x) << \sum_{k=1}^{\infty} M_k (x \in E)$

then prove that $\displaystyle\sum_{k=1}^{\infty} U_k$ converges uniformly on E.

b) Prove that $\dfrac{d}{dx}\displaystyle\sum_{n=1}^{\infty} \dfrac{x^n}{n(n+1)} = \sum_{n=0}^{\infty} \dfrac{x^n}{n+2}$ for $|x| < 1$.

ii) a) Find the value of $\displaystyle\int_0^{\pi} \dfrac{1}{a + b\cos x}\,dx$, $a > 0$ and $|b| < a$ and hence deduce that

$$\int_0^{\pi} \dfrac{dx}{(a + b\cos x)^2} = \dfrac{\pi a}{(a^2 - b^2)^{3/2}}$$

b) Prove that $\displaystyle\int_0^{\infty} \dfrac{1 - e^{-ax}}{x} e^{-x}\,dx = \log(1 + a)$.

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T.Y. B.Sc. (Semester–IV) Examination, 2009
MATHEMATICS (Paper–III)
MT–343 : Problem Course Based on MT-341 and MT-342

Time : 2 Hours   Max. Marks : 40

N.B : 1) *All* questions are *compulsory*.

2) *Figures to the **right** indicate **full** marks.*

3) *Answers to the **two** Sections should be written in **separate** answer books.*

SECTION–I
(Complex Analysis)

1. Attempt **each** of the following :   **5**

   i) Find the image of the semi-infinite strip $x > 0, 0 < y < 2$ under the transformation $W = iz + 1$.

   ii) Find $\underset{z=i}{\operatorname{Res}} \dfrac{z^3 + 2z}{(z-i)^2}$

   iii) Expand Cos z into Taylor series about the point $z = \dfrac{\pi}{2}$.

   iv) Evaluate : $\displaystyle\int\limits_{|z|=1} \dfrac{1}{z^2 + 2z + 2} dz$

   v) Write the function $f(z) = z + \dfrac{1}{z}$, $z \neq 0$ in the form $f(z) = u(r, \theta) + iv(r, \theta)$.

2. Attempt **any two** of the following :   **10**

   i) Show that the function $u(x, y) = \dfrac{1}{2}\log(x^2 + y^2)$ is harmonic and find its harmonic conjugate.

ii) Find the linear fractional transformation that maps 2, i, –2 onto 1, i, –1.

iii) Using Cauchy-Residue theorem evaluate $\int_C \dfrac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$, where C is the circle $|z| = 3$.

3. Attempt **any one** of the following :   **5**

   i) Obtain Laurent's series which represent the function $f(z) = \dfrac{z^2-1}{(z+2)(z+3)}$ in the regions $|z| < 2$ and $2 < |z| < 3$.

   ii) Let C be the circle $|z| = 3$, described in the positive sense. Show that if

   $$g(w) = \int_C \dfrac{2z^2-z-2}{z-w} dz,\ |w| \neq 3,$$

   then $g(z) = 8\pi i$. What is the value of g (w) when $|w| > 3$?

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SECTION–II

(Real Analysis–II)

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1. Attempt **each** of the following :   **5**

   i) Using definition, show that $\int_0^1 \dfrac{1}{\sqrt{x}} dx$ is convergent.

   ii) Show that $\int_1^\infty e^{-x^2} dx$ is convergent.

   iii) State Cauchy's principle of uniform convergence of a sequence $\{f_n\}_{n=1}^\infty$.

   iv) Show for all real x, the series $\sum_{n=1}^\infty \dfrac{\sin nx}{n^2}$ converges uniformly.

   v) If $\int_0^\pi \dfrac{dx}{\alpha - \cos x} = \dfrac{\pi}{\sqrt{\alpha^2-1}}, \alpha > 1$, find the value of $\int_0^\pi \dfrac{1}{(2-\cos x)^2} dx$.

2. Attempt **any two** of the following : **10**

    i) If $f_n(x) = nxe^{-nx^2}$ then show that sequence $\{f_n\}_{n=1}^{\infty}$ converges pointwise but not uniformly on [0, 1].

    ii) Show that series $\sum_{n=1}^{\infty} \dfrac{x}{n^P + n^q x^2}$, for all $x \in R$ is uniformly convergent if $p + q > 2$.

    iii) Discuss the convergence of $\int_{0}^{\pi} \dfrac{\sqrt{x}}{\sin x}\, dx$.

3. Attempt **any one** of the following : **5**

    i) Prove that $\int_{0}^{1}\left[\sum_{n=1}^{\infty} \dfrac{x^n}{n^2}\right]dx = \sum_{n=1}^{\infty} \dfrac{1}{n^2(n+1)}$.

    ii) Starting with suitable integral prove that $\int_{0}^{\pi/2} \dfrac{\sin^2 x}{(a^2 \sin^2 x + b^2 \cos^2 x)^2}\, dx = \dfrac{\pi}{4a^3 b}$.

    Hence deduce that

$$\int_{0}^{\pi/2} \dfrac{1}{(a^2 \sin^2 x + b^2 \cos^2 x)^2}\, dx = \dfrac{\pi}{4a^3 b^3}(a^2 + b^2).$$

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T.Y. B.Sc. (Semester – IV) Examination, 2009
MATHEMATICS (Paper – IV)
MT-344 : Ring Theory

Time : 2 Hours   Max. Marks : 40

Instructions: *i)* ***All*** *questions are* ***compulsory***.
              ii) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Attempt **each** of the following :   **10**

   i) Is the following statement true or false ? Justify.

   'Every ring with unity has atleast two units'.

   ii) Find the remainder when 3^{47} is divided by 23.

   iii) Is the following statement true or false ? Justify.

   'The field of quotients of $\mathbb{Q}$ is $\mathbb{R}$ '.

   iv) Describe all ideals of the ring $\mathbb{R}$.

   v) List all zero divisors in the ring $\mathbb{Z}_{12}$.

   vi) Give an example of a ring R and a subring S of R such that R has unity but S does not have unity.

   vii) If R is a ring and f(x), g(x) in R[x] are of degrees 3 and 4 respectively, then f(x)g(x) is always of degree 7.

   Is the above statement true or false ? Justify.

   viii) Is $x^3 + 2x + 3$ an irreducible polynomial in $\mathbb{Z}_5$ [x] ? Justify.

   ix) Is $< x^2 + 1 >$ a maximal ideal of $\mathbb{C}$ [x] ? Justify.

   x) Show that 6 does not factor uniquely (upto associates) into irreducibles in $\mathbb{Z}\left[\sqrt{-5}\right]$. Exhibit two different factorizations.

P.T.O.

2. Attempt **any two** of the following :   10

   i) Prove that every field is an Integral Domain.

   ii) If A and B are ideals of a ring R, prove that the sum $A + B = \{a + b / a \in A, b \in B\}$ is also an ideal of R.

   iii) Let R be a commutative ring with unity. If M is a maximal ideal of R, prove that R/M is a field.

3. Attempt **any two** of the following :   10

   i) For a Euclidean Domain D with Euclidean valuation U, prove that $u \in D$ is a unit iff $U(u) = U(1)$. Hence or otherwise find all units in the Gaussian ring of integers $\mathbb{Z}[i]$.

   ii) Prove that $1 + x + x^2 + x^3 + x^4$ is irreducible over $\mathbb{Q}$.

   iii) Prove that every Euclidean domain is a PID.

4. Attempt **any one** of the following :   10

   i) Let $f(x) = a_n x^n + a_{n-1} x^{n-1} + ...+ a_0$ and $g(x) = b_m x^m + b_{m-1} x^{m-1} + ...+ b_o$ be two elements of F[x] (where F is a field) with a_n and b_m both non-zero elements of F and $m > 0$. Prove that there are unique polynomials q(x) and r(x) in F[x] such that $f(x) = g(x) q(x) + r(x)$ with deg r(x) < deg g(x).

   Also factorise $x^4 + 4$ into linear factors in $\mathbb{Z}_5[x]$.

   ii) a) Prove that $\mathbb{Z}[x]$ is a UFD.

     b) Show that $\{a + xf(x) / a \in 2\mathbb{Z}, f(x) \in \mathbb{Z}[x]\}$ is an ideal in $\mathbb{Z}[x]$.

     c) Is $\mathbb{Z}[x]$ a PID ? Justify.

     d) Is $\mathbb{Z}[x]$ a Euclidean Domain ? Justify.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
MATHEMATICS (Paper – V)
MT – 345 : Differential Equations

Time : 2 Hours   Max. Marks : 40

N.B. : *i) **All** questions are **compulsory**.*
        *ii) Figures to the **right** indicate **full** marks.*

1. Attempt **each** of the following :   **10**

   i) Define Clairaut's partial differential equation.

   ii) Find the integral curves of the equation

   $$\frac{dx}{yz} = \frac{dy}{zx} = \frac{dz}{xy}$$

   iii) Obtain the partial differential equation by eliminating arbitrary function f from the equation $Z = x + y + f(xy)$.

   iv) Find the complete integral of $pq = 1$.

   v) Show that the direction ratios of the tangent line to the conic section $x^2 + y^2 + z^2 = 1$, $x + y + z = 1$ are proportional to $y - z$, $z - x$, $x - y$.

   vi) Define Pfaffian differential equation.

   vii) Find the primitive of $2xzdx + zdy - dz = 0$.

   viii) Show that $u = \log x + \log y$ and $v = xy$ are functionally related and find the relation between them.

   ix) Write Charpit's auxiliary equation for $f(x, y, z, p, q) = 0$.

   x) Show that the differential equation $(y + z) dx + dy + dz = 0$ is integrable.

2. Attempt **any two** of the following : **10**

   i) Show that a necessary and sufficient condition that the Pfaffian differential equation $\overline{X}.d\overline{r} = 0$ should be integrable is that $\overline{X}.curl\,\overline{X} = 0$.

   ii) Solve :

     $y\,(1 + z^2)\,dx - x\,(1 + z^2)\,dy + (x^2 + y^2)\,dz = 0.$

   iii) Find the integral curves of the equation

$$\frac{dx}{x(y-z)} = \frac{dy}{y(z-x)} = \frac{dz}{z(x-y)}$$

3. Attempt **any two** of the following : **10**

   i) Explain the method of solving first order partial differential equations

     A) $f\,(p, q) = 0$

     B) $f\,(p, q, z) = 0$

   ii) Find the integral surface of the linear partial differential equation

     $2y\,(z - 3)\,p + (2x - z)\,q = (2x - 3)y$

     passing through the curve $x^2 + y^2 = 2x$ and $z = 0.$

   iii) Find the orthogonal trajectories on the surface $x^2 + y^2 + 2fyz + d = 0$ of its curves of intersection with planes parallel to the plane XOY.

4. Attempt **any one** of the following : **10**

   i) a) Explain the method of solving the homogeneous Pfaffian differential equation

      $P\,dx + Q\,dy + R\,dz = 0$

     b) Solve :

      $zy^2\,dx + zx^2\,dy - x^2y^2\,dz = 0$

   ii) a) Explain Jacobi's method for solving partial differential equation

      $f\,(x_1, x_2, x_3, p_1, p_2, p_3) = 0$ where x_1, x_2, x_3 are independent variables and

      $p_i = \dfrac{\partial z}{\partial x_i}\ (i = 1, 2, 3)$

     b) Solve $(p^2 + q^2)\,y = qz$ by Charpit's method.

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
MATHEMATICS (Paper – VI)
MT – 346 : Problem Course (Based on MT 344 and MT 345)

Time : 2 Hours   Max. Marks : 40

N.B : 1) ***All*** *questions are* ***compulsory***.
   2) *Figures to the* ***right*** *indicate* ***full*** *marks.*
   3) *Answers to the* ***two*** *Sections should be written on*
      separate *answer sheets.*

SECTION – I
(Ring Theory)

1. Attempt **each** of the following :   **5**

   i) Prove that the only idempotents of an Integral domain are 0 and 1.

   ii) Is 5 an irreducible element in the ring of Gaussian integers ? Justify.

   iii) List all ideals of $\mathbb{Z}_{40}$ containing the unity 1.

   iv) Find all solutions of the equation $x^2 + 2x + 4 = 0$ in $\mathbb{Z}_6$.

   v) Give two examples of ring homomorphisms of $\mathbb{Z}$ into $\mathbb{Z}$.

2. Attempt **any two** of the following :   **10**
   i) Let R be a commutative ring with unity of prime characteristic p. Show that the
      map $\phi : R \to R$ given by $\phi(a) = a^p$ is a homomorphism.
   ii) Obtain the field of quotients of the Integral Domain
      $D = \left\{ a + b\sqrt{2} \,/\, a, b \in \mathbb{Z} \right\}$.
   iii) A ring R is called a Boolean ring if $a^2 = a$, $\forall\, a \in R$. Prove that every Boolean ring
      is commutative.

3. Attempt **any one** of the following :   **5**

   i) Use Euclidean algorithm in $\mathbb{Z}[i]$ to find a gcd of $8 + 6\,i$ and $5 - 15\,i$ in $\mathbb{Z}[i]$.

   ii) Find all maximal and prime ideals in $\mathbb{Z}_{12}$.

P.T.O.

SECTION – II
(Differential Equation)

1. Attempt **each** of the following : **5**

   i) Eliminate the constants a and b from the relation $(x-a)^2 + (y-b)^2 + z^2 = 1$ and obtain the partial differential equation.

   ii) Solve $ydx + xdy + 2zdz = 0$.

   iii) Find the complete integral of Clairaut's partial differential equation.
   $pqz = p^2(qx+1) + q^2(py+1)$.

   iv) Solve $\dfrac{dx}{x} = \dfrac{dy}{y} = \dfrac{dz}{x+y}$.

   v) Write Jacobi's auxiliary equation for $p_1^2 + p_2^2 + p_3 x_1 = 1$.

2. Attempt **any two** of the following : **10**

   i) Solve : $(2xz - yz)dx + (2yz - zx)dy - (x^2 - xy + y^2)dz = 0$ by Natani's method.

   ii) Solve : $2xz - px^2 - 2qxy + pq = 0$ by Charpit's method.

   iii) Solve $\dfrac{\partial z}{\partial x} + \dfrac{\partial z}{\partial y} = x + y + z$.

3. Attempt **any one** of the following : **5**

   i) Find the integral curves of $\dfrac{dx}{mz - ny} = \dfrac{dy}{nx - lz} = \dfrac{dz}{ly - mx}$.

   ii) Show that the differential equations $xp - yq = x$, $x^2p + q = xz$ are compatible.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
MATHEMATICS (Paper – VII)
MT – 347 (A) : Operations Research – II
MT – 347 (B) : Lattice Theory
MT – 347 (C) : Computational Mathematics – II
MT – 347 (D) : Computational Geometry

Time : 2 Hours   Max. Marks : 40

Note : 1) Candidates are advised to see the relevant paper and solve the same.
2) **Use** of logarithmic tables and calculators is **allowed**.
3) Graph paper will be **supplied** on demand.
4) **All** questions are **compulsory**.
5) Figures to the **right** indicate **full** marks.

MT – 347 (A) : Operations Research – II

1. Attempt the following :   **10**

    i) State any one rule of dominance principle.

    ii) In a game of matching coins, player A wins Rs. 3 if there are two heads, wins nothing if there are two tails and loses Rs. 2 when there is one head and one tail. Determine the pay off matrix.

    iii) What is meant by fair game ?

    iv) What is no passing rule in a sequencing problem ?

    v) Explain when a game is called a two person zero sum game.

    vi) What are the three time estimates used in the context of PERT ?

    vii) Explain the term event (node).

    viii) Give any one use of float.

    ix) Define the term critical path.

    x) State any one assumption of the sequencing problem.

P.T.O.

2. Attempt **any two** of the following : **10**

   i) There are seven jobs, each of which has to go through the machines A and B in the order AB, processing times in hours are given as :

Job	:	1	2	3	4	5	6	7
Machine A	:	3	12	15	6	10	11	9
Machine B	:	8	10	10	6	12	1	3

   Determine a sequence of these jobs that will minimize the total elapsed time T.

   ii) A firm is considering replacement of a machine whose cost price is Rs. 1,20,000 and the scrap value is Rs. 20,000. The running (maintenance and operating) cost are as follows.

Year	1	2	3	4	5	6	7	8
Running cost (Rs.)	2,000	5,000	8,000	12,000	18,000	25,000	32,000	40,000

   The firm wants to determine after how many years should the machine be replaced on economic basis.

   iii) Task A, B, C, ..., H, I constitute a project. The precedence relationships are A < D ; A < E; B < F; D < F; C < G; C < H; F < I; G < I.

   Draw a network to represent the project.

3. Attempt **any two** of the following : 10

i) Solve the following game using graphical method. The pay off is for player A

		B			
		B_1	B_2	B_3	B_4
A	A_1	1	4	–2	–3
	A_2	2	1	4	5

ii) Using dominance rule, find the optimal strategies for player A and player B in the following game. Also obtain the game value.

		B			
		I	II	III	IV
A	I	19	6	7	5
	II	7	3	14	6
	III	12	8	18	4
	IV	8	7	13	-1

iii) Consider the following game. The pay off is for player A.

		B		
		B_1	B_2	B_3
A	A_1	5	3	7
	A_2	7	9	1
	A_3	10	6	2

4. Attempt **any one** of the following : **10**

   i) A project has the following characteristics.

Activity	Preceding Activity	Expected completion time (In weeks)
A	none	5
B	A	2
C	A	6
D	B	12
E	D	10
F	D	9
G	D	5
H	B	9
I	C, E	1
J	G	2
K	F, I, J	3
L	K	9
M	H, G	7
N	M	8

   i) Draw a network for this project.

   ii) Find a critical path and project completion time.

ii) The data for a PERT network is given in the following table.

Time Estimates

Activity	Optimistic	Most likely	Pessimistic
1 – 2	2	4	6
1 – 3	6	6	6
1 – 4	6	12	24
2 – 3	2	5	8
2 – 5	11	14	28
3 – 4	15	24	45
3 – 6	3	6	9
4 – 6	9	15	27
5 – 6	4	10	16

a) Draw a network for the project.

b) Compute the expected project completion time.

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MT – 347 (B) : Lattice Theory

Time : 2 Hours   Max. Marks : 40

*N.B. : 1) **All** questions are **compulsory**.*
*2) Figures to the **right** indicate **full** marks.*

1. Attempt **each** of the following :   **10**

    i) Define complete lattice.

    ii) Write Jordan – Dedekind condition.

    iii) Draw a Hasse – diagram of the lattice of positive factors of 18 under divisibility.

    iv) Prove or disprove : Every chain is a lattice.

    v) Define distributive lattice.

    vi) In a lattice L, for all a, b ∈ L, show that $a \wedge (a \vee b) = a$.

    vii) Show that any meet homomorphism preserves order.

    viii) True or False ? Justify : The union of two ideals is an ideal.

    ix) Show that the lattice given by the following diagram is modular.

    x) Consider a lattice of positive factors of 100, under divisibility. Find the ideal generated by 20.

2. Attempt **any two** of the following : **10**

   i) Show that in a lattice L, for all a, b, c $\in$ L,

$$(a \wedge b) \vee (b \wedge c) \vee (c \wedge a) \leq (a \vee b) \wedge (b \vee c) \wedge (c \vee a).$$

   ii) Show that the homomorphic image of a distributive lattice is distributive.

   iii) Draw the diagram of a lattice of positive factors of 20 under divisibility and show that it is the same as that of the product of two chains with three and two elements.

3. Attempt **any two** of the following : **10**

   i) In a Boolean algebra, prove that,

$$(a')' = a, (a \wedge b)' = a' \vee b'.$$

   ii) Express the function $f = (a \wedge b) \vee (a \wedge c) \vee (b' \wedge c)$ in the disjunctive normal form.

   iii) Simplify the circuit represented by

$$f = (a \wedge c' \wedge d') \vee (a \wedge b' \wedge d) \vee (a \wedge c \wedge d').$$

4. Attempt **any one** of the following : **10**

   i) a) Define prime ideal. Show that a lattice L is a chain if and only if all ideals in L are prime.

      b) In a bounded distributive lattice, prove that the complement of an element is unique, if it exists.

   ii) a) Prove that the set of all ideals of a lattice L forms a lattice under $\subseteq$ relation.

      b) Show that a lattice of length two is modular.

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MT – 347 (C) : Computational Mathematics – II

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* ***All*** *questions are* ***compulsory.***
             2) Figures to the ***right*** *indicates* ***full*** *marks.*

1. Attempt **each** of the following :   **10**

   i) Describe the array that is defined in the following statement.

      float C[8] = {2., 5., 3., –4.,};

   ii) Define a two-dimensional, 3×4 integer array n. Assign the following values to the array elements.

10	12	14	16
20	22	24	26
30	32	34	36

   iii) Explain the meaning of the following function prototype.

        unsigned f(unsigned a, unsigned b);

   iv) Write the first line of the function definition, including the formal argument declaration, for the situation described below.

       A function called sample generates and returns an integer quantity.

   v) Explain the meaning of the following declaration

      float a, b;

      float *Pa, *Pb;

   vi) Explain the meaning of the following declaration char c1, c3;

       char *Pc3 = &c1;

   vii) Declare a two-dimensional floating-point array, with 15 rows and 30 columns, using pointer notation.

   viii) Declare an array of strings whose initial values are "red", "green" and "blue".

   ix) What is use of a library function fgetc ?

   x) State any two advantages to the use of functions.

2. Attempt **any two** of the following : **10**

   i) Write a program to interchange two columns of a matrix.

   ii) Write a short note on static variables.

   iii) Write a short note on dynamic memory allocations.

3. Attempt **any two** of the following : **10**

   i) Write a short note on arrays of pointers.

   ii) Write a short note on reading and writing a data file.

   iii) Define complex number using structure and write a program to find product of two complex numbers.

4. Attempt **any one** of the following : **10**

   i) a) Write a program to count number of words in a text file.

      b) Write a short note on pointers.

   ii) a) Write a program to copy text file.

      b) What is the output generated by the following program ?

```
# include <stdio.h>

  main ( )

{ static int x[10] = {10, 11, 12, 13, 14, 15, 16, 17, 18, 19};

 int i;

 for (i = 0; i < = 2; + + i)

 {   print f ("\n i = %d x[i] = %d *(x + i) = %d",

            i, x[i], *(x + i));

   print f ("& x[i] = %x x + i = %x", & x[i], (x + i));

 }

}
```

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MT – 347 (D) : Computational Geometry

Time : 2 Hours   Max. Marks : 40

1. Attempt **each** of the following :   **10**

    i) Apply reflection through the line y = – x on the point p[1.5 –3].

    ii) If a 2×2 transformation matrix $[T] = \begin{bmatrix} 3 & 1 \\ -1 & 1 \end{bmatrix}$ is applied to the square of side

      4 cm, then find the area of the resulting figure.

    iii) Write the transformation matrix for rotation about the y-axis through an angle –70°.

    iv) How to construct an axonometric projection ?

    v) The line segment between the points A[2 1] and B[–3 3] is transformed to the line segment A*B* using the transformation matrix,

      $[T] = \begin{bmatrix} -1 & 1 \\ 2 & 1 \end{bmatrix}$. Find the slope of A* B*.

    vi) Define : Principal vanishing points.

    vii) Define : Persepective projection.

    viii) Find the value of $\delta\theta$ to generate 8 points on the ellipse $\dfrac{x^2}{16} + \dfrac{y^2}{9} = 1$.

    ix) Write the parametric equation of parabola $Y^2 = 4ax$.

    x) What is the determinant of the inverse of any pure rotation matrix ?

2. Attempt **any two** of the following : **10**

   i) Suppose a 2×2 transformation matrix $[T] = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is used to transformed the line segment PQ to the line segment P*Q*. If slope of the line segment PQ is m, then prove that, the slope of the line segment P*Q* is $m^* = \dfrac{b + dm}{a + cm}$.

   ii) Position vector [2 5] is rotated about the point [4, 3] by angle $\theta = 90°$, using homogeneous co-ordinate system, obtain position vector of transformed point.

   iii) Point P[4 2 1] in a plane is transformed to the point A*[x* y* 1] under the homogeneous transformation matrix,

   $$[T] = \begin{bmatrix} 0 & -2 & 2 \\ -2 & 2 & -2 \\ 1 & 0 & 1 \end{bmatrix}$$

   Prove that $x^{*^2} + y^{*^2} = 1$.

3. Attempt **any two** of the following : **10**

   i) The object is to be rotated through about the line passing through A[4 5 7] and B[6 8 10]. Determine the angle of rotation about the x-axis say α and angle of rotation about the y-axis say-β, so that the line coincides with the z-axis.

   ii) Rotate the line segment AB, where A[3 3 3] and B[5 5 5] about the local x-axis passing through P[2 3 1], through an angle 75°.

   iii) Obtain the concatenated matrix representation of the following transformation in order.

   (α) Rotation about y-axis by $\phi = -30°$.

   (β) Rotation about x-axis by $\theta = 45°$.

   (γ) Projected on to z = 0 plane from a centre of projection z = z_c = 2.5.

4. Attempt **any one** of the following : **10**

    i) a) Derive iterative formula to generate n uniformly spaced points on the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \, .$$

      b) Generate 8 distinct uniformly spaced points on the ellipse $\dfrac{x^2}{4} + \dfrac{y^2}{1} = 1 \, .$

    ii) Find the parametric equation of the Bezier curve for the control points $B_0[2 \ 1]$, $B_1[4 \ 4]$, $B_2[5 \ 3]$ and $B_3[5 \ 1]$. Compute the position vectors of the points on the curve for parameter values. t = 0.1, 0.2, ... 0.9.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
MATHEMATICS (Paper – VIII)
MT – 348 (A) : Lebesgue Integration
MT – 348 (B) : Differential Geometry – II
MT – 348 (C) : Computational Mathematics – IV
MT – 348 (D) : Astronomy – II

Time : 2 Hours   Max. Marks : 40

*Note : 1) Candidates are advised to see the **relevant** question paper and*
solve the same.
*2) **Use** of logarithmic tables and calculators is **allowed**.*
*3) **All** questions are **compulsory**.*
*4) Figures to the **right** indicate **full** marks.*

MT – 348 (A) : Lebesgue Integration

1. Attempt **each** of the following :   **10**

   i) True or false ? If F is a closed subset of [a, b] and |F| = 0, then F = ϕ.

   ii) If $G = (0,1) \ U\left(\dfrac{1}{2}, 2\right)$ then find $\overline{m}G$.

   iii) If $E \subseteq [a, b]$ and $\overline{m}E = 0,$ prove that E is measurable and mE = 0.

   iv) Find ^3f, if $f(x) = \dfrac{1}{\sqrt[3]{x}}$ $0 < x \leq 1$ and $f(0) = 0.$

   v) Find f^+, if $f(x) = x^2 - 1,$ $-2 \leq x \leq 2.$

   vi) Give an example of an uncountable subset of measure zero in $\mathbb{R}'$.

   vii) Let E be a subset of [a, b]. If the characteristic function x_E is measurable then prove that E is a measurable set.

   viii) Give an example of a function defined on [0, 1] which is not Lebesgue integrable.

   ix) Write the Fourier series of $f(x) = \sin 3x + \cos 8x$ for $x \in [0, 2\pi]$.

   x) For a subset E of [0, 1], prove that $\underline{m}E \leq \overline{m}E.$

                                                                                              P.T.O.

2. Attempt **any two** of the following : **10**

   i) If G_1 and G_2 are open subsets of [a, b] such that $G_1 \subset G_2$ then prove that $|G_1| \leq |G_2|$.

   ii) If E_1 and E_2 are measurable subsets of [a, b] then prove that both $E_1 \cup E_2$ and $E_1 \cap E_2$ are measurable and $mE_1 + mE_2 = m(E_1 \cup E_2) + m(E_1 \cap E_2)$.

   iii) If E_1 and E_2 are measurable subsets of [a, b], prove that the symmetric difference of E_1 and E_2 is also measurable.

3. Attempt **any two** of the following : **10**

   i) Let $\{f_n\}_{n=1}^{\infty}$ be a sequence of measurable functions on [a, b] such that the sequence $\{f_n(x)\}_{n=1}^{\infty}$ is bounded for each $x \in [a, b]$.

   Let $M(x) = l.u.b. \{f_1(x), f_2(x), f_3(x), ...\}$, $a \leq x \leq b$

   $m(x) = g.l.b. \{f_1(x), f_2(x), f_3(x), ...\}$, $a \leq x \leq b$

   Then prove that $M(x)$ and $m(x)$ are both measurable.

   ii) If f is a bounded measurable function on [a, b], then prove that $f \in \mathcal{L}[a, b]$.

   iii) If $f \in \mathcal{L}[a, b]$ is bounded and if $E \subset [a, b]$ such that $mE = 0$ then show that $\int_E f = 0$.

4. Attempt **any one** of the following : **10**

   i) a) If $f \in h[a, b]$ then prove that for given $\varepsilon > 0$, there exists a $\delta > 0$ such that

   $\left| \int_E f \right| < \varepsilon$, whenever $mE < \delta$.

   b) Find the Fourier series for

   $f(x) = -1 \quad (-\pi \leq x < 0)$

   $= 1 \quad (0 \leq x \leq \pi)$.

   ii) a) Let f be a non negative valued function in $\mathcal{L}[a, b]$. For each $n = 0, 1, 2, 3, ...$

   let $E_n = \{x / n \leq f(x) < n + 1\}$. Prove that $\sum_{n=0}^{\infty} n.mE_n < \infty$.

   b) Find the Fourier series for the function $f(x) = x \quad (-\pi \leq x \leq \pi)$.

   _____

MT – 348 (B) : Differential Geometry – II

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* **All** *questions are* **compulsory**.
       2) *Figures to the* **right** *indicate* **full** *marks.*

1. Attempt **each** of the following :   **10**

   i) On the surface of revolution

      $$x = u\cos\phi, \ y = u\sin\phi, \ z = f(u),$$

      What are the parametric curves u = constant, and what are the curves ϕ = constant ?

   ii) State the necessary and sufficient condition that the parametric curves form an orthogonal system.

   iii) Determine E, F, G for the surface

      $$x = a(u + v), \ y = b(u - v), \ z = uv.$$

   iv) Define a minimal surface.

   v) State Euler's theorem on normal curvature.

   vi) When do you say that a point P on a surface is a parabolic point ?

   vii) Define 'asymptotic line'.

   viii) If the surface is given by $x = f_1(u, v)$, $y = f_2(u, v)$ and $z = f_3(u, v)$. State the condition under which the parametric curves v = constant will be geodesics.

   ix) State the torsion of an asymptotic line.

   x) State Meunier's theorem.

2. Attempt **any two** of the following : **10**

   i) Show that if L, M, N vanish at all points on a surface then the surface is part of a plane.

   ii) Taking x, y as parameters, calculate the fundamental magnitudes and the normal to the surface $2z = ax^2 + 2hxy + by^2$.

   iii) Prove that the differential equations of the curves which bisect the angle between the parametric curves are $\sqrt{E}\,du - \sqrt{G}\,dv = 0$ and $\sqrt{E}\,du + \sqrt{G}\,dv = 0$.

3. Attempt **any two** of the following : **10**

   i) Prove that the geodesics on a circular cylinder are helices.

   ii) Prove that on the surface $z = f(x, y)$ the asymptotic lines are $rdx^2 + 2sdxdy + tdy^2 = 0$ and their torsions are

$$\pm\ \frac{\sqrt{s^2 - rt}}{(1 + p^2 + q^2)}.$$

   iii) Show that the family of curves on the surface $\bar{r} = \bar{r}(u, v)$ are given by $\phi(u, v) = \text{constant}$ and $\Psi(u, v) = \text{constant}$ generate conjugate directions if

$$L\frac{\partial \phi}{\partial v}\frac{\partial \Psi}{\partial v} - M\left(\frac{\partial \phi}{\partial u}\frac{\partial \Psi}{\partial v} + \frac{\partial \phi}{\partial v}\frac{\partial \Psi}{\partial u}\right) + N\frac{\partial \phi}{\partial u}\frac{\partial \Psi}{\partial v} = 0.$$

4. Attempt **any one** of the following : **10**

   i) Prove that the necessary and sufficient condition for a surface to be a developable surface is that its Gaussian curvature is zero.

   ii) a) If k and τ are curvature and torsion of a geodesic, prove with usual notations that

$$\tau^2 = (k - k_a)\,(k_b - k).$$

      b) Prove that on a surface of revolution, the parametric curves are the lines of a curvature.

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MT – 348 (C) : Computational Mathematics – IV

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* ***All*** *questions are* ***compulsory****.*

2) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Attempt **each** of the following :   **10**

   i) Write an algorithm to push an element on stack.

   ii) Write an algorithm to add node at the head of a linked list.

   iii) Sort the numbers : 5, 3, 1, 4, 2 using bubble sort.

   iv) Define a binary tree.

   v) Draw binary search tree if the following numbers are given in the order :
   5, 3, 1, 4, 9.

   vi) State any two advantages of array over singly linked list.

   vii) Evaluate postfix expression : 4 5 + 7 5 – ÷.

   viii) State any two advantages of singly linked list over doubly linked list.

   ix) State any two applications of the binary search tree.

   x) Write a function to display a binary tree in postorder traversal.

2. Attempt **any two** of the following :   **10**

   i) Write an algorithm to sort numbers in ascending order using Insertion sort.

   ii) Write an algorithm to search an element in a binary search tree.

   iii) Write an algorithm to delete an element from the tail of a singly linked list.

3. Attempt **any two** of the following :   **10**

   i) Convert the following infix expression to postfix expression. Show all stack steps.

     (A* X + B) / (C * Y + D).

   ii) Write a function to reverse a singly linked list

   iii) Write an algorithm to evaluate a postfix expression.

4. Attempt **any one** of the following :   **10**

   i) a) Write a function to sort numbers using bubble sort.

       b) Write an algorithm to count number of nodes in a singly linked list.

   ii) a) Write a function to add an integer at the head of a doubly linked list.

       b) Write an algorithm to add an element in a binary search tree.

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MT – 348 (D) : Astronomy – II

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* ***All*** *questions are* ***compulsory****.*
2) *Figures to the* ***right*** *indicate* ***full*** *marks.*

1. Attempt **each** of the following :   **10**

   i) State Kepler's third law of planetary motion.

   ii) Define : Mean anomaly and True anomaly.

   iii) State the equation of time due to obliquity.

   iv) Explain the direct motion of planet.

   v) What is phase of the new moon ?

   vi) Define : Perihelion and Aphelion.

   vii) What is the relation between synodic period and sidereal period for inner planets ?

   viii) Define elongation of a planet.

   ix) State the condition for maximum brightness of a planet.

   x) State combined effect of precession and nutation on right ascension and declination in terms of independent day numbers.

2. Attempt **any two** of the following :   **10**

   i) Express the true anomaly v in terms of eccentric anomaly E.

   ii) Prove that the equation of time due to obliquity of ecliptic is maximum when logitude $\odot$ of the sun is given by $\text{Sin} \odot = \dfrac{1}{\sqrt{2}} \sec \epsilon / 2$.

   iii) If the line joining two planets to one another subtends an angle of $60°$ at the sun when the planets appear to each other to be stationary, show that $a^2 + b^2 = 7\,ab$, where a and b are the distances of the planets from the sun.

3. Attempt **any two** of the following :   **10**

    i) Discuss the independent day numbers.

    ii) Assuming that the Earth and Venus move in circular orbits at distances a and b from the Sun, prove that when brightness of Venus as seen from the Earth is a maximum $\cos^2 E + \dfrac{4}{3}\left(\dfrac{a}{b}\right)\cos E = \dfrac{4}{3}$, where E is the elongation of the Venus as seen from the earth.

    iii) Explain seasons.

4. Attempt **any one** of the following :   **10**

    i) Obtain the expression for precession in right ascension and declination.

    ii) Show that a southern star of declination δ and right ascension α must at some epoch have been visible from a station in north latitude ϕ, provided that $\sin\delta\cos\epsilon + \cos\delta\sin\epsilon\sin\alpha < \cos(\phi - \epsilon)$. Where ϵ is the obliquity of the ecliptic.

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
PHYSICS
PH-341 : Solid State Physics (Paper – I)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.
2) *Figures to the right indicate full marks.*
3) *Use of log tables and calculators is allowed.*

1. Attempt **all** of the followings (**one** mark **each**) :   **10**

   a) State the parameters on which Hall coefficient depends.

   b) Why continuous wavelength X-ray radiation is used in Laue Method ?

   c) Find number of atoms per unit cell in BCC structure.

   d) What is Curie temperature ?

   e) State the principal cause of bonding in ionic crystals.

   f) Why do atoms differ in their radii from the corresponding ions ?

   g) Define the term 'Magnetization $(\vec{M})$'.

   h) A fcc crystal has interatomic distance $a = 0.326\,\text{A}^\circ$. Find distance between (200) lattice planes.

   i) Sketch (110) plane in SC unit cell.

   j) Is rotation of $2\pi/5$ possible about an axis passing through a lattice point for symmetry operation ? Comment.

2. Attempt **any two** :

   a) What is Madelung constant ? Evaluate Madelung constant for an infinite line of ions of alternate sign.   **5**

   b) Obtain an expression for energy levels in three dimension, for an electron of mass 'm' confined in a box of length 'L'.   **5**

   c) What is reciprocal lattice ? Obtain expressions for reciprocal lattice vectors $\vec{A}, \vec{B}$ and $\vec{C}$.   **5**

3. Attempt **any two** :

   a) Two atoms P and Q are separated by distance 'r'. Their potential energy in the field

   of each other is given by $U = -\dfrac{A}{r^2} + \dfrac{B}{r^6}$ where A and B are constants (A, B > 0).

   At what separation they will form a stable compound ? **5**

   b) Find packing fraction for fcc crystal structure. Give comment. **5**

   c) In Hall experiment an n-type Ge semiconductor is arranged. It has donor density of $10^{15}/cm^3$. When magnetic field $B_z = 2.5$ weber/m^2 is applied, a current density of $J_x = 400\,A/m^2$ results ? What will be the Hall voltage if the specimen is 6 mm thick ? **5**

4. A) Attempt **any one** :

   a) Describe X-ray powder diffraction method with the help of neat diagrams. Explain how it is used to study crystal structure. **8**

   b) Define the term 'Magnetic Susceptibility (χ_m)'. Obtain Langevin formula for paramagnetic susceptibility. **8**

   B) Attempt **any one** :

   a) Calculate longest wavelength that can be analysed by rocksalt of crystal spacing 1.5 A° in the first order. **2**

   b) A small bar of semiconducting material is used in Hall experiment. Find carrier concentration (n) in it using that data :

   i) Hall coefficient $R_H = -5.66 \times 10^2\,\dfrac{cm^3}{C}$

   ii) Charge on electron $e = 1.6 \times 10^{-19}\,C$. **2**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – II)
PH-342 : Quantum Mechanics

Time : 2 Hours　　　　　　　　　　　　　　　　　　　　　　Max. Marks : 40

N.B. : 1) **All** *questions are* **compulsory**.
　　　2)　Figures to the **right** *indicate* **full** *marks.*
　　　3)　Use of log tables and calculators is allowed.

1. Attempt **all** of the following (**one** mark **each**) :

   a) Represent graphically the infinite potential well.

   b) Write momentum operators corresponding to x, y, z components of $\hat{P}$.

   c) Find the eigen value of the operator $\dfrac{d^2}{dx^2}$ for the eigen function sin x.

   d) Find the de-Broglie wavelength of neutron moving with speed 1.38×10^4 M/s. (Given : mass of neutron = 1.676×10^{-27} kg, h = 6.625×10^{-34} J/s).

   e) Write down the Schrodinger's time-independent equation in spherical polar coordinates.

   f) State Ehrenfest's theorem.

   g) Define ground state energy.

   h) Write the relation between phase velocity and group velocity.

   i) What are the values of m_l for the given value of l ?

   j) Define ladder operators.

2. Attempt **any two** :

   a) Show that phase velocity of the de-Broglie wavelength associated with the particle of rest mass m_o and wavelength λ is given by　　　　　　**5**

   $$V_P = c\sqrt{1 + \left(\frac{m_o c \lambda}{h}\right)^2}$$

b) A step potential is given by

V (x) = 0 for x ≤ 0

= V_0 otherwise

Solve steady state Schrodinger's equation for E > V_0 to obtain expression for probability of reflection and transmission across the barrier. **5**

c) Obtain Schrodinger's time independent equation from time dependent equation. Show that time part of wave function is $e^{-iEt/\hbar}$. **5**

3. Attempt **any two** :

a) Using ground state wavefunction of the simple harmonic oscillator, show that the ground state energy is $\frac{1}{2}\hbar\omega$. **5**

b) Prove that the eigen values of the Hermitian operator are real. **5**

c) The wavefunction of a certain particle is $\Psi = A\cos^2 x$ for $\frac{-\pi}{2} \le x \le \frac{\pi}{2}$. Find the value of A. **5**

4. A) Attempt **any one** :

a) Obtain the Schrodinger's equation for a rigid rotator with a free axis and solve it to obtain energy eigen values and eigen functions. **8**

b) I) Show that $\Delta E . \Delta t \ge \frac{\hbar}{2}$ and $\Delta L . \Delta\theta \ge \frac{\hbar}{2}$. **4**

II) Show that if two operators $\hat{A}$ and $\hat{B}$ have common set of eigen functions, then they commute with each other. **4**

B) Attempt **any one** :

a) Determine the party of the wave function $e^{-\alpha r}$ and $\cos\theta \ e^{-\alpha r}$. **2**

b) Prove that **2**

$$\left[\overline{A}, \overline{B} + \overline{C}\right] = \left[\overline{A}, \overline{B}\right] + \left[\overline{A}, \overline{C}\right]$$

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T. Y. B.Sc. (Sem. – IV) Examination, 2009
PHYSICS (Paper – III)
PH – 343 : Thermodynamics and Statistical Mechanics

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All questions are* **compulsory**.
2) *Figures to the* **right** *indicate* **full** *marks.*
3) **Use** *of log-tables and calculator is* **allowed**.

1. Attempt **all** of the following (**one** mark **each**) :   **10**

   a) What are bosons ?

   b) What do you mean by rotation of the molecule ?

   c) Give relation between Boyle temp. and Inversion temp.

   d) Define thermal conductivity of a gas.

   e) What are the types of ensemble ?

   f) Write Wien's law of displacements.

   g) What is thermodynamic probability ?

   h) What are fermions ?

   i) What do you mean by molecular speed ?

   j) A bag contains 7 red, 5 white and 8 black balls. What is the probability of drawing a black ball ?

2. Attempt **any two** :

   a) Compare M.B. and B.E. statistics.   **5**

   b) Write a note on adiabatic demagnetisation.   **5**

   c) Explain thermal interaction and mechanical interaction between two systems.   **5**

3. Attempt **any two** :

a) Show that $\lambda = \dfrac{m}{\pi\sigma^2\rho}$ where symbols have their usual meanings. **5**

b) Note the following table :

Number of Particles	Velocity in m/s
2	5
3	7
4	8

Calculate average velocity. **5**

c) Deduce the temperature of a star whose radiation has maximum in wave length region $\lambda = 5500\,AU$
Given - Wein's constant = 0.003 m°k. **5**

4. A) Attempt **any one** :

a) Obtain Maxwells law of distribution of molecular speeds in the form

$$dN = 4\pi N\left(\frac{m}{2\pi KT}\right)^{3/2} e^{\frac{-mv^2}{2KT}}\ V^2 dV$$

where symbools have their usual meanings. **8**

b) Explain four thermodynamical potentials U, H, F and G. Hence obtain Maxwell's four thermodynamic relations. **8**

B) Attempt **any one** :

a) What do you mean by symmetry of wavefunction ? **2**

b) Calculate mean free path of molecules of a gas which has molecular diameter of 2×10^{-10} m and molecular density 3×10^{25} mol/m^3. **2**

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
PHYSICS (Paper – IV)
PH - 344 : Nuclear Physics

Time : 2 Hours   Max. Marks : 40

N.B. : *i)* **All** *questions are* **compulsory**.
         ii) Figures to the **right** *indicate* **full** *marks.*
         iii) **Use** *of log tables and calculator is* **allowed**.

1. Attempt **all** of the following :   **10**

   a) State the basic properties of the nucleus (any four).

   b) State law of successive disintegration.

   c) If half life period is 1590 years for a particular element, calculate its decay constant.

   d) What are elementary particles ?

   e) Find the total charge for a quark structure uud.

   f) What are magic numbers ?

   g) What is compound nucleus ?

   h) What is nuclear fusion ?

   i) What is threshold voltage ?

   j) List different types of particle accelerators.

2. Attempt **any two** of the following :

   a) The mass of deuteron ($_1H^2$) nucleus is 2.013553 a.m.u. Calculate the mass defect, packing fraction, binding energy and binding energy per nucleon.

      Given : Mass of proton = 1.007825 a.m.u.

                Mass of neutron = 1.008665 a.m.u.   **5**

   b) Derive the expression $R = \dfrac{\lambda_2}{\lambda_2 - \lambda_1}\left[1 - e^{-(\lambda_2 - \lambda_1)t}\right]$, where symbols have their usual

      meanings.   **5**

c) Using the empirical formula of binding energy, find the binding energy of the nucleus $_{39}Y^{89}$.

Given : $\quad a_v = 14.1$ MeV $\qquad a_c = 0.59$ MeV

$\qquad\qquad a_s = 13$ MeV $\qquad a_a = 19.0$ MeV

$\qquad\qquad a_p = -35.5$ MeV for even z even N nuclei

$\qquad\qquad\quad = 0$ for odd z , even N or even z, odd N nuclei

$\qquad\qquad\quad = + 35.5$ MeV for odd z odd N Nuclei. **5**

3. Attempt **any tw**o of the following :

a) Explain in brief Meson theory of nuclear forces. **5**

b) Find the threshold energy of the reaction $_{13}Al^{27}(\alpha, p)\,_{15}P^{31}$ Given : the masses are
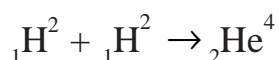
$_{13}Al^{27} = 25.986892$ a.m.u.

$p = 1.007625$ a.m.u.

$_{15}P^{31} = 30.973765$ a.m.u.

$_2He^4 = 4.002603$ a.m.u. **5**

c) Calculate the net release of energy in the following reaction :

$_1H^2 + \,_1H^2 \rightarrow \,_2He^4$

Given : Mass of $_1H^2 = 2.014741$ a.m.u.

$\qquad\quad$ Mass of $_2He^4 = 4.003379$ a.m.u. **5**

4. A) Attempt **any one** of the following :

a) Draw a sketch of G.M. counter. Explain its construction and working. **8**

b) Describe the principle and working of a linear accelerator and show that the total length of the accelerator is proportional to the wavelength λ, of the radio frequency signal. **8**

B) Attempt **any one** of the following :

a) Compute the mass of 1 curie of C^{14}. The half life of C^{14} is 5700 years. **2**

b) State limitations of shell model. **2**

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
PHYSICS (Paper – V)
PH – 345 (A) : Electronics

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
2) *Figures to the **right** indicate **full** marks.*
3) *Use of log table and calculator are **allowed**.*

1. Attempt **all** (**1** mark **each**) :   **10**

   a) Define efficiency of transformer.

   b) Draw the symbol of P-channel JFET.

   c) Define load Regulation.

   d) Draw the symbol of 'SPDT' switch.

   e) Define hybrid parameters.

   f) Define positive feedback.

   g) What is comparator ?

   h) What is positive regulator ?

   i) Find the reactance of the capacitor C= 470 μ F at frequency of 100 Hz.

   j) In a feedback inverting amplifier, the values of input and feedback resistance are
   30 kΩ and 120 kΩ respectively. Determine the voltage gain.

2. Attempt **any two** :

   a) Describe with neat diagram 3-terminal adjustable regulator.   **5**

   b) Draw the circuit diagram of three OPAMP instrumentation amplifier. State the
   applications of instrumentation amplifier.   **5**

   c) With the help of neat diagram, explain the function and working of electromagnetic
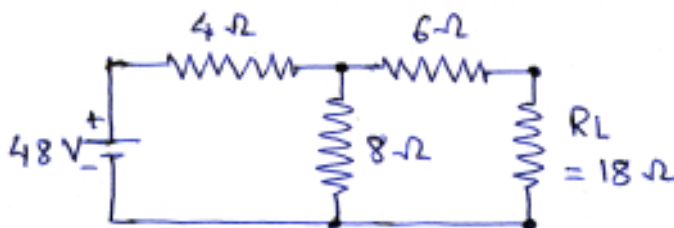   relay.   **5**

3. Attempt **any two** :

a) Find the Thevenin's equivalent circuit for the following circuit, and hence find the load current flowing through load resistance. **5**

b) In a n-channel JFET, biased by potential divider method, it is desired to set the operating point at $I_D = 2.5$ mA and $V_{DS} = 24$ V. Find the value of Rs.

Given : $R_1 = R_2 = 1$ MΩ, $V_{DD} = 25$ V, $I_{DSS} = 12$ mA and $V_P = -5$ V. **5**

c) In an adder configuration using OPAMP, the values of R_1, R_2 and R_3 are 10 kΩ, 5kΩ and 15 kΩ respectively. The input source potentials are $V_1 = 0.6$ V, $V_2 = 0.5$ V and $V_3 = -4$V. Determine resistance R_F if the observed output is +2V. **5**

4. A) Attempt **any one** :

a) i) Draw and explain the output characteristics of JFET. **4**

ii) Draw a labelled simplified circuit of the IC 723 regulator. **4**

b) Draw the circuit diagram of class-B push-pull amplifier. Show that the maximum attainable efficiency of class-B push-pull amplifier is 78.5%. **8**

B) Attempt **any one** :

a) In differential amplifier its differential mode gain is 250 and common mode gain is 0.025. Calculate its CMRR in d_B. **2**

b) Determine peak to peak ripple voltage when the load current is approximately 10 mA and the filter capacitor is 1000 μ F in a bridge rectifier to which an input of line frequency 50 Hz is connected. **2**

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
PHYSICS (Paper – V)
PH – 345 (B) : Advanced Electronics

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.
2) *Figures to the right indicate full marks.*
3) *Draw neat diagramS wherever necessary.*
4) *Use of log tables and calculators is allowed.*

1. Attempt **all** of the following (**one** mark **each**) :   **10**

   a) State the advantage of R-2R ladder D/A converter over weighted resistor D/A converter.

   b) Which A/D converter type is the fastest ?

   c) What are transmission gates ?

   d) What is a multiplexer ?

   e) Where is a decade counter useful ?

   f) What is an asynchronous counter ?

   g) A monostable multivibrator uses a resistance of 200 kΩ and a capacitor of 10μf. What must be its pulse width ?

   h) What is the difference between a NAND gate and a NOR gate ?

   i) A sinusoidal carrier is amplitude modulated to a depth of 40%. If the carrier power is 10 KW, what must be the power contained in one of its side bands ?

   j) What is the supply voltage, range over which 74 C and 4000 B families of CMOS IC's can work ?

2. Attempt **any two** :

   a) Explain the operation of a monostable multivibrator. **5**

   b) What is LED ? What are its normal voltage and current values when it works satisfactorily ? Draw a simple circuit that shows how LED can be driven. **5**

   c) Discuss the characteristics of output and speed with reference to TTL and CMOS integrated circuits. **5**

3. Attempt **any two** :

   a) A sinusoidal carrier voltage of frequency 5 MHz and amplitude 100 V is amplitude modulated by a sinusoidal voltage of frequency 20 KHz producing 30% modulation. Calculate the frequency and amplitude of upper and lower side bands. **5**

   b) A 600 W carrier is modulated to a depth of 75%. Calculate the total power in the modulated wave. **5**

   c) In an FM system when the audio frequency (AF) is 400 Hz and the AF voltage is 1.8 V the deviation is 4.8 KHz. If the voltage is now increased to 7.2 V what is the new deviation ? If the voltage remains same but the frequency is increased to 800 Hz, what is the new deviation ? **5**

4. A) Attempt **any one** :

   a) Using a suitable diagram explain the construction and working of charge-discharge type A/D converter. **8**

   b) How are optical fibers classified ? What are their important characteristics ? **8**

  B) Attempt **any one** :

   a) An astable multivibrator using IC 555, uses the following component values :

     $R_A = 100 \text{ k}\Omega$ $R_B = 100 \text{ k}\Omega$ $C = 0.005 \mu f$

     Calculate the on-time. **2**

   b) Define : a) Sequential logic b) Combinational logic. **2**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (A))
(Elective – II) PH 346 : Astronomy and Astrophysics – II

Time : 2 Hours　　　　　　　　　　　　　　　　　Max. Marks : 40

*N.B.: 1) **All** questions are **compulsory**.*
*2) Figures to the **right** indicate **full** marks.*
*3) Draw neat diagrams **wherever** necessary.*

1. Attempt **all** of the following :　　　　　　　　　　**10**

    a) State the condition to get molecular spectra of the material.

    b) What are Fraunhoffer's lines ?

    c) What are blue giants ?

    d) State any two types of galaxies.

    e) When red shift occur in the spectrum ?

    f) State Hubbles law.

    g) What is open universe ?

    h) What are close binaries ?

    i) Explain the term 'black hole'.

    j) What do you mean by neutron star ?

2. Attempt **any two** :

    a) Write short note on super novae.　　　　　　　　　**5**

    b) Describe theory of evolution of galaxies in brief.　　**5**

    c) Discuss how the stars are classified on HR diagram.　**5**

3. Attempt **any two** :

   a) Distinguish between continuous emission and absorption spectra. **5**

   b) Discuss the evidences of big-bang theory. **5**

   c) Write short note on – 'Quasars'. **5**

4. A) Attempt **any one** :

   a) Give in brief the history of space exploration from launching of sputnik mission till date. **8**

   b) Discuss various cosmological models. **8**

  B) Attempt **any one** :

   a) What are 'Seyfert galaxies' ? **2**

   b) Explain – 'Chandrashekhar limit'. **2**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (B))
PH 346 : Biophysics – II

Time : 2 Hours   Max. Marks : 40

N.B.: 1) *All questions are **compulsory**.*
2) *Figures to the **right** indicate **full** marks.*
3) *Draw neat diagrams **wherever** necessary.*

1. Attempt **all** of the following :   **10**

   a) State different colours used for ECG leads.

   b) Define – Chemical shift δ.

   c) What is NMR ?

   d) Define bond length.

   e) What is normal breathing rate ?

   f) What is polypeptides ?

   g) Calculate H^+ ion concentration of solution having pH value 4.

   h) Write a equation explaining photosynthesis.

   i) What are thylakoids ?

   j) Define – Vital capacity of lung (VC).

2. Attempt **any two** :   **10**

   a) Explain primary structure of protein.

   b) Explain construction and working of photoelectric calorimeter with neat diagram.

   c) Write short note on – Half cell potential.

3. Attempt **any two** : **10**

  a) With neat diagrams explain Cis and Trans configuration.

  b) Distinguish between chloroplast reaction and mitochondrial reaction.

  c) Explain construction of glass electrode of pH meter and explain its working.

4. A) Attempt **any one** : **8**

  a) Explain indirect method of measurement of B.P. using sphygmomanometer. State its advantages.

  b) i) Draw and explain Ramchandran conformational diagram of polypeptide chain.

    ii) Why cells require sources of free energy ?

  B) Attempt **any one** : **2**

  a) Explain hydrogen bonding.

  b) The angle of diffraction is 30° for first order diffraction of X-ray. The distance between two planes of biomolecule is 12×10^{-9} meter. Calculate wavelength of X-ray.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (C))
PH 346 : Communication Electronics – II

Time : 2 Hours   Max. Marks : 40

N.B.:   *1)* ***All*** *questions are* ***compulsory****.*
         2) Draw neat diagrams ***wherever*** *necessary.*
         3) Figures to the ***right*** *indicate* ***full*** *marks.*
         4) Use of log tables and calculators is ***allowed****.*

1. Attempt **all** of the following (**one** mark **each**) :   **10**

   a) State the major advantage of FM.

   b) What is meant by a straight radio receiver ?

   c) What is semi-duplex communication ?

   d) State a typical frequency lying in medium wave range.

   e) What is the nature of modulation of video signal in TV telecast ?

   f) State the purpose of using AGC in radio receivers.

   g) Draw a sketch indicating how receiver output voltage varies with incoming signal strength for a receiver with ideal AGC.

   h) What is the difference between a padder and a trimmer ?

   i) Why is synchronisation necessary in TV receiver ?

   j) What is step index fiber ?

2. Attempt **any two** :

   a) Compare merits and demerits of AM with FM.   **5**

   b) Write a note on microwave communication.   **5**

   c) Explain the basic principles of traditional telephony.   **5**

3. Attempt **any two** :

   a) A recording of a musical concert uses frequencies between 200 to 6000 Hz. If it is broadcast by an AM radio station operating at 900 kHz, what must be the bandwidth of the transmitted signal ? **5**

   b) A FM radio station operates at a frequency of 90.2MHz. Earlier it used to function at 100.0 MHz. What must have been the corresponding wavelength change ? **5**

   c) Calculate the critical angle of incidence between two substances with different refractive indices where, $n_1 = 1.48$ and $n_2 = 1.46$. **5**

4. A) Attempt **any one** of the following :

   a) Using suitable diagram explain the structure of composite video signal. **8**

   b) Write a note on the cables used in fiber optical communication. **8**

   B) Attempt **any one** of the following :

   a) State the image frequency in a radio receiver, receiving program at 1480 KHz and using IF of 455 KHz. **2**

   b) Explain the need of blanking in TV. **2**

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[3617] – 414

T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (D))
PH 346 : Electro Acoustics and Entertainment Electronics – II

Time : 2 Hours   Max. Marks : 40

N.B.: 1) *All* questions are *compulsory*.
2) *Figures to the right indicate full marks.*
3) *Use of log table and calculator is allowed.*

1. Attempt **all** of the following :   **10**

   a) Define transducer.

   b) Explain pitch of sound.

   c) Define Ten dB.

   d) What is the unit of sound intensity ?

   e) What is threshold ?

   f) Give two basic principles of compact disc.

   g) Explain concept of L.L.

   h) What is cut off frequency ?

   i) Explain acoustic delay.

   j) What is sensitivity of microphone ?

2. Attempt **any two** :

   a) Explain motion picture sound recording and magnetic recording.   **5**

   b) What is electro-acoustic transducer ? Describe moving coil microphone.   **5**

   c) How amplifier amplifications are evaluated for an auditorium ?   **5**

3. Attempt **any two** :

   a) Write a short note on 'ultrasonic medical topography'. **5**

   b) What are requirements for good quality sound recording and reproduction system ? **5**

   c) Explain video recording of sound. **5**

4. A) How amplifier specifications are derived for an auditorium ? **8**

                 OR

  A) Explain photograph disc recording and reproduction with historic information. **8**

  B) Attempt **any one** :

   a) Write a note on magnetic tape. **2**

   b) What is directivity of microphone. **2**

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[3617] – 414

T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (E))
PH 346 : Medical Instrumentation – II

Time : 2 Hours

Max. Marks : 40

N.B.: *1)* **All** *questions are* **compulsory**.

     2) Figures to the **right** *indicate* **full** *marks.*

     3) Draw neat diagram **wherever** *necessary.*

1. Attempt **all** of the following (**one** mark **each**) :   **10**

    a) List any two components of blood.

    b) Define diastole blood pressure.

    c) What is biopotential ?

    d) State the elements of volume conductor field.

    e) Define cardiac output.

    f) What do you mean by EMG ?

    g) What do you mean by Polarized cell ?

    h) What do you mean by pace maker ?

    i) What do you mean by microwave diathermy ?

    j) What is the range of X-rays used for medical diagnostic purpose ?

2. Attempt **any two** of the following :

    a) Draw the waveform of action potential. Label the amplitude, time values and explain these in brief.   **5**

    b) Discuss the blood pressure value in human males and females at different age.   **5**

    c) Explain principle and use of fibre optics in medical instruments.   **5**

3. Attempt **any two** of the following :

    a) Draw a block diagram of X-ray machine. Explain each block in brief. **5**

    b) State different types of Bioelectrical potentials. Explain any one in brief. **5**

    c) Draw a block diagram of electrocardiograph system. Explain its operation. **5**

4. A) Attempt **any one** of the following :

    a) State the principle of ultrasonic flowmeters. Give the ultrasonic transducer configuration used in the measurements. **8**

    b) i) What are the basic requirements of amplifier for biopotential signals ? **4**

      ii) What are the different types of Plethysmographs ? Explain any one type in brief. **4**

  B) Attempt **any one** of the following :

    a) Give the importance of heat therapy. **2**

    b) What are microelectrodes ? **2**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (F))
PH 346 : Motion Picture Physics – II

Time : 2 Hours

Max. Marks : 40

N.B.: 1) *All* questions are *compulsory*.
2) *Figures to the* *right* *indicate* *full* *marks*.
3) *Draw neat diagrams* *wherever* *necessary*.

1. Attempt **all** of the following (**one** mark **each**) :　　　　　　　　　**10**

   a) What is fast motion ?

   b) What is gamma factor ?

   c) What is sproket ?

   d) What do you mean by master print ?

   e) What is use of D-log E curve in photography ?

   f) What is miniature ?

   g) State various colour mixing methods.

   h) Define wipe.

   i) List types of colour films.

   j) Define zoom lens.

2. Attempt **any two** of the following :

   a) Explain freeze action and reverse motion.　　　　　　　　　　　　**5**

   b) Explain in detail spool box of projector.　　　　　　　　　　　　**5**

   c) Explain additive and subtractive methods of printing.　　　　　　　**5**

3. Attempt **any two** of the following :

   a) Describe Intermittent mechanism of movie camera.   **5**

   b) Explain colour reversal film.   **5**

   c) Explain image combination in detail.   **5**

4. A) Attempt **any one** of the following :

   a) Explain in detail image formation in colour negative film.   **8**

   b) Explain camera accessories and camera movements in detail.   **8**

  B) Attempt **any one** of the following :

   a) What is fed ?   **2**

   b) What is use of filters in colour photography ?   **2**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (G))
PH 346 : Renewable Energy Sources – II

Time : 2 Hours   Max. Marks : 40

N.B.: *1) **All** questions are **compulsory**.*
*2) Figures to the **right** indicate **full** marks.*
*3) Draw neat diagrams **wherever** necessary.*
*4) Use of log tables and calculators is **allowed**.*

1. Attempt **all** of the following (**one** mark **each**) :   **10**

   a) State the photovoltaic principle.

   b) State the principle of wind turbine.

   c) What is biomass ?

   d) What is solar module ?

   e) State any two factors affecting efficiency of solar cell.

   f) State any four applications of photovoltaic systems.

   g) State different types of solar cell.

   h) State the advantages of renewable energy sources.

   i) What is the difference between pyrolysis and gasifaction ?

   j) What is energy conservation ?

2. Attempt **any two** :

   a) What is energy audit ? Explain the types of energy audit.   **5**

   b) Explain in detail horizontal axis type wind mills.   **5**

   c) Compute the system output and current of a PV array for a 100 Watt load needed for 24 hours at 24 V at New Delhi ($\phi = 28°35'$), mean horizontal isolation from standard map $H_O = 5.4$ KWh/m^2.   **5**

3. Attempt **any two** :

  a) What do you mean by renewable energy sources ? Explain how energy obtained from sea waves. **5**

  b) Explain in detail PV system for water pumping. **5**

  c) Write a note on thermochemical conversion process of Biomass. **5**

4. A) Attempt **any one** :

   a) What is solar cell ? Describe its construction and working principle. Explain its IV characteristics, define fill factor and conversion efficiency. **8**

   b) Explain in detail vertical Axis type wind mills. **8**

  B) Attempt **any one** :

   a) State the various forms of energy wastage. **2**

   b) Explain energy plantation. **2**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (H))
PH 346 : Basic Microprocessor and Programming – II

Time : 2 Hours   Max. Marks : 40

N.B.: 1) ***All*** *questions are* ***compulsory***.

2) *Figures to the* ***right*** *indicate* ***full*** *marks.*

3) *Draw neat diagrams* ***wherever*** *necessary.*

4) *Use of log table and calculator is* ***allowed***.

1. Attempt **all** (**one** mark **each**) :   **10**

   a) Why RST 6.5 is numbered so ?

   b) What is seven-segment code for 8 in common anode and common cathode seven-segment display ?

   c) What is "T_w" -Wait state ?

   d) What are different fields on the coding sheet for writing an assembly language programme ?

   e) Give the sequence of events when RST.4 instruction is executed.

   f) What will be the control word is 8255 if all ports are working as In-put ports in mode.O ?

   g) How many address-pins are there in a memory-chip with 4K (four kilo) memory locations ?

   h) Explain the instruction XCHG in 8085.

   i) What is the addressing mode in instruction LX1 H, 8000H ?

   j) What are delimiters ? Enlist them.

2. Attempt **any two** :

   a) What are Software and Hardware interrupt ? Give interrupt vector diagram.   **5**

   b) Enlist various addressing modes in 8085. Give one example of each, explaining it.   **5**

   c) How the instructions are classified into different groups according to their functions ? Give one example of each group and explain the instruction in example.   **5**

3. Attempt **any two** :

   a) An array of n numbers (unsigned) is stored in memory, starting with address 6020H. Draw the flowchart and write an assembly language programme to arrange them in descending order.   **5**

   b) A set of signed numbers is stored in memory. There are 'n' such numbers. First number is stored in memory location 3050 H. Draw the flow chart and write an ALP to find the number of –ve numbers.   **5**

   c) Two 16-bit numbers are stored in memory locations 2020H & 2021H and 3030H & 3031H. Draw flowchart and write an ALP to find their sum, store the sum in memory locations 4040H & 4041H.   **5**

4. Attempt **any one** :

   a) Draw the block-diagram of PPI-8255. Give the control-word-format. Explain various Handshake signals in it.   **10**

   b) Draw the circuit diagram of the minimum system using 8085, 8156 and 8355. Explain its features.   **10**

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[3617] – 414

T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (I))
PH 346 : Auxiliary Electronics

Time : 2 Hours

Max. Marks : 40

N.B.:   *i)* ***All*** *questions are* ***compulsory****.*

         ii) Figures to the ***right*** *indicate* ***full*** *marks.*

         iii) Use of electronic calculator and log table is ***allowed****.*

1. Attempt **all** of the following (**one** mark **each**) :   **10**

    a) Draw the symbol of ferrite core inductor.

    b) State one unique features of an auto transformer.

    c) What is major advantage of using a solid state relay ?

    d) State one application of an inductor.

    e) What is peak value of voltage if the mains a.c. supply momentarily acquires value of 250V rms ?

    f) What is PTC and NTC ?

    g) Draw symbol of Thermistor.

    h) State any two types of transformer.

    i) What are various ranges available in d.c. current measurement in simpson 260 multimeter ?

    j) What is resistive loss in transformer ?

2. Attempt **any two** :

    a) Discuss the precautions to be taken while making PCB.   **5**

    b) What is seebeck effect. How is it used in measuring temperature of an unknown body using a thermocouple.   **5**

    c) Using a suitable diagram, explain the construction of any one of the Acoustical microphones known to you.   **5**

3. Attempt **any two** :

   a) A wire strain gauge with a gauge factor 2 is bounded to metal chamber which is subjected to a strain of 20×10^{-6}. If original resistance of gauge is $300\,\Omega$, calculate the change in gauge resistance.   **5**

   b) Calculate the time required by $10\,\mu F$ capacitor connected to 40 V supply in series with $8\,k\Omega$ to change to a voltage of 20 V.   **5**

   c) If the gauge factor is 1.96. Calculate Poisson's ratio for a given sample of India rubber if strain gauge were constructed.   **5**

4. A) Attempt **any one** :
    a) Explain the principles of function generator using IC 8038.   **8**
    b) Describe with neat block diagram of CRO and explain working of CRO.   **8**

   B) Attempt **any one** :
    a) At main frequency an Inductor offers a reactance of $1000\,\Omega$ what must have been the value of inductance ?   **2**
    b) What is the resistance in ohms offered by a capacitor of $0.1\,\mu F$ connected to an AC supply of 230 Volts at 50 Hz frequency ?   **2**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (J))
PH 346 : Elements of Material Science

Time : 2 Hours   Max. Marks : 40

N.B.: 1) **All** questions are **compulsory**.
        2) *Figures to the **right** indicate **full** marks.*
        3) *Use of calculators and log tables is **allowed**.*

1. Attempt **all** of the following (**1** mark **each**) :   **10**

   a) Name any two mechanical properties of materials.

   b) Define the term ductility. State any one example of ductile material.

   c) Carbon has higher diffusivity in iron than does Nickel in iron. Why ?

   d) What do you mean by strain hardening ?

   e) The polyvinyl chloride has degree of polymerisation 500 and molecular mass of 31,250 a.m.u. find the mer mass.

   f) What is glass transition temperature ?

   g) What is the effect of temperature on recrystallization ?

   h) State the difference between soft and hard magnets.

   i) State the Gibb's phase rule.

   j) Give the importance of phase diagrams.

2. Attempt **any two** :

   a) Discuss the variation of mechanical properties in annealing.   **5**

   b) What are linear polymers ? Distinguish between addition polymerization and condensation polymerization.   **5**

   c) State the characteristic features of AX compounds. Discuss the AX-structure of NaCl type.   **5**

3. Solve **any two** :

a) One out of 10^{10} atoms has the energy required to jump out of its lattice site into an interstitial position at 500°C. At 600°C this fraction is increased to 10^{-9}. Calculate the energy required for this jump.   **5**

b) A brine contains 10% NaCl (90% H_2O by weight). How many grams of water per 100 gm brine must be evaporated before the solution becomes saturated at 50°C ? Solubility of NaCl in brine is 27%.   **5**

c) Calculate the equilibrium concentration of vacancies in Aluminium at 900°k using following data :
$\Delta H = 68$ kJ / mole , Gas constant R = 8.314 J/mole°k.   **5**

4. A) Attempt **any one** :
   a) What are the objectives of phase diagrams ? Draw the Pb-Sn phase diagram and explain the phases present in the diagram.   **8**
   b) What do you mean by plastic deformation ? Explain the phenomenon of plastic deformation in polycrystalline materials.   **8**

   B) Attempt **any one** :
   a) Explain the structure-properties and processing relationship in brief.   **2**
   b) Give the classification of ceramic materials.   **2**

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[3617] – 414

T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (K))
PH 346 : Vacuum Technology

Time : 2 Hours   Max. Marks : 40

N.B.: 1) **All** questions are **compulsory**.

2) Figures to the **right** indicate **full** marks.

3) Use of log tables and calculators is **allowed**.

1. Attempt **all** of the following (**one** mark **each**) :   **10**

   a) State two applications of vacuum systems.

   b) Define true leak.

   c) What is outgassing ?

   d) Define effective speed of pump.

   e) Define ultimate pressure.

   f) State the unit of conductance.

   g) Define thermal conductivity.

   h) Define mean free path.

   i) State the use of gaskets.

   j) What is soldering ?

2. Attempt **any two** of the following :

   a) Find the effective pump speed for the pump of pumping speed 70 lit/sec with conductance 60 lit/sec.   **5**

   b) Determine the pump down time to reduce the pressure 300 torr to 10^{-1} torr for a vessel of 60 lit. The speed of the pump is 30 lit/sec.   **5**

   c) Describe the oil diffusion pump with neat diagram.   **5**

3. Attempt **any two** of the following :

   a) Describe different types of O-rings and their designs. **5**

   b) Explain construction and working of pirani gauge with neat diagram. **5**

   c) Explain the use of vacuum pumps in industries and laboratories. **5**

4. A) Attempt **any one** of the following :

   a) Explain principle, construction and working of oil sealed rotary pump with neat diagram. **8**

   b) Explain thermal conductivity and viscosity of gases at low and high temperatures. **8**

  B) Attempt **any one** of the following :

   a) Explain the importance of liquid nitrogen in vacuum systems. **2**

   b) What is meant by clean vacuum ? **2**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
PHYSICS (Paper – VI (L))
PH 346 : Lasers

Time : 2 Hours   Max. Marks : 40

> *N.B.:* 1) *All* questions are *compulsory*.
> 2) *Figures to the right indicate full marks.*
> 3) *Use of log table and calculator is allowed.*

1. Answer **all** of the following (**each** carries **one** mark) :   **10**

   a) State the wave length of the prominent wave length emitted by a Ruby laser.

   b) Define spontaneous emission.

   c) How can the process of stimulated emission be represented symbolically ?

   d) What is pumping ?

   e) What is natural broadening of a spectral line ?

   f) "The distances measurable using interferometric technique can not exceed a few hundred meters'. State whether the statement is true or false.

   g) What is the nature of output available from the Argon laser.

   h) What does monochromaticity of a light beam denote measure of its special coherence or temporal coherence ?

   i) The frequency of radiation 2.83×10^{13} Hz. Calculate the wave length.

   j) What is polarization ?

2. Attempt **any two** of the following :   **10**

   a) State and explain the use of lasers in medicine.

   b) Explain four level pumping scheme. How can the four level pumping scheme provide continuous wave mode lasers.

   c) How are lasers useful in Range finding ?

3. Attempt **any two** of the following : **10**

a) Find the relative population of the two states in a Ruby laser that produces a light beam of wave length 6943 A° at 300 K

$(h = 6.626 \times 10^{-34} Js)$

b) A pulsed laser is constructed with a ruby crystal as the active element. The ruby rod contains typically a total of $3 \times 10^{19} Cr^{3+}$ ions. If the laser emits light at 6943 A° wave length find a) the energy of one emitted photon (in eV) and b) the total energy available per laser pulse (assuming total population inversion)

c) Explain the concept of spatial coherence.

4. A) Answer **any one** of the following :

a) Explain the three processes in lasers. State important features of stimulated emission. **8**

b) Describe the construction and working of Ruby laser. **8**

B) Attempt **any one** of the following :

a) A laser beam of 5 mW has a wave length of 6328 A°. Calculate the number of photons emitted per second. **2**

b) State any two uses of CO_2 laser. **2**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
CHEMISTRY – I
CH – 341 : Physical Chemistry

Time : 2 Hours   Max. Marks : 40

N.B.: 1) **All** questions are **compulsory**.
2) *Figures to the* **right** *indicate* **full** *marks.*
3) *Use of logarithmic table and calculator is* **allowed***.*
4) *Actual calculations must be shown while solving* **problems***.*

1. Answer the following :   **10**

   a) How conductivity water is prepared ?

   b) Define 'E.M.F.' of cell.

   c) Explain the term isotone with suitable example.

   d) Define 'Adsorbent'.

   e) Define the term 'Curie'.

   f) What are retarded reactions ?

   g) What is 'Equivalent Conductance'.

   h) The resistance of N/50 KCl solution at 25°C is 400 ohm. If the specific conductance of same solution at 25°C is 0.002765 $ohm^{-1}.cm^{-1}$, calculate cell constant.

   i) The emf of following cell reaction,

   $Zn(s) + Cu^{++} \rightleftharpoons Zn^{++} + Cu(s)$ is 1.1 volt at 25°C. Calculate ΔG of the cell reaction (1 F = 96500 Coulomb).

   j) Calculate mass defect in $^{20}_{10}Ne$. If its isotopic mass is 19.99240 a.m.u. (Given : m_H = 1.007825 a.m.u. and m_n = 1.008665 a.m.u.).

P.T.O.

2. A) Answer the following (**any two**) :   **6**

    i) Discuss the factors affecting amount of gas adsorbed by solids.

    ii) Describe amalgam electrode.

    iii) How ionic product of water is determined from conductance measurement ?

  B) Solve **any one** of the following :   **4**

    i) Find out the p^H of unknown solution at 25°C

      Pt | Hg, $Hg_2d_2(s)$ | Sat KCl || Unknown p^H solution | Quinhydrane | Pt

      [Given : $E_{cal} = -0.2415$ volt, $E_Q^c = 0.6997$ volt and $E_{cell} = 0.138$ volt]

    ii) Find the rate of disintegration per minute of 3.0 gm of ^{232}Th. Half life of ^{232}Th is 1.3×10^{10} years.

3. Attempt **any two** of the following :   **10**

  i) State and illustrate Kohlrausch's law. How is it useful in finding $\wedge_\infty$ of weak electrolytes.

  ii) Construct electrolyte concentration cell with transference in which electrodes are reversible with cation of electrolyte and derive expression for its emf.

  iii) Explain construction and working of proportional counter.

4. A) Discuss any three applications of adsorption.   **6**

          OR

  Derive the mathematical expression for decay constant (λ). Show that half life period of a radioelement is independent of initial quantity.

  B) Solve **any one** of the following :   **4**

    i) Conductivities at infinite dilution of NH_4Cl and NaOH are 129.8 and 248.7 $ohm^{-1} cm^2$ g eq^{-1}. Ionic conductivities of Na^+ ions and Cl^- ions are 50.1 and 76.3 $ohm^{-1} cm^2$ g eq^{-1}.resp. Specific conductivity of 0.01 N NH_4OH solution is $9.6 \times 10^{-5} ohm^{-1}.cm^{-1}$. Calculate degree of dissociation of NH_4OH in 0.01 N solution.

    ii) The EMF of cell

      Cd | $CdCl_2$, 512 H_2 0 (sat) | AgCl | Ag is 0.6753 volt at 25° C and 0.6928 volt ay 0°C. Calculate ΔH and ΔS of cell reaction at 25° C.

T.Y.B.Sc. (Semester – IV) Examination, 2009
CHEMISTRY – II
CH–342 : Inorganic Chemistry

Time : 2 Hours   Max. Marks : 40

N.B. :   *i)* ***All*** *questions are* ***compulsory.***
        ii) Figures to ***right*** *indicate* ***full*** *marks.*
        iii) Actual calculations ***must*** *be shown.*
        iv) Marks are reserved for ***neat*** *and* ***labelled*** *diagrams.*
        v) ***Use*** *of log table and calculator is* ***allowed.***
        vi) Atomic numbers : ***Na=11, Mn=25, Fe=26, I=53.***

1. Answer the following :   **10**

     I) Define 'Corrosion'.

    II) Which metal act as an anode in tinned iron ?

   III) What is the atomic number of an element having symbol Unn ?

   IV) What do you mean by trans-uranic elements ?

    V) Which disease is caused due to deficiency of Vit. B12 ?

   VI) How many bridging carbonyls are present in $Mn_2 (CO)_{10}$?

  VII) Which catalyst is used in the Wacker's process ?

 VIII) Define 'insulator'.

   IX) What type of semiconductivity is shown by germanium doped with indium ?

    X) What types of voids are present in the closest packing ?

2. A) Write short notes on **any two** of the following :   **6**

     I) Galvanisation

    II) Nuclear fission fuels.

   III) Biological role of iron.

   B) Answer **any two** of the following :   **4**

     I) Find the valence electrons in $Fe_3(CO)_{12}$ and state whether it follows 18 electron rule or not.

    II) Explain the semiconductivity shown by non-stoichiometric $\overline{NiO}$.

   III) Write the Born-Lande equation for calculating the lattice energy with the physical significance of the terms involved.

P.T.O.

3. Answer **any two** of the following : **10**

   I) Define the term 'passivity'. Explain the oxide film theory of passivity. Give the evidences in favour of this theory.

  II) What is lanthanide contraction ? Give the causes of lanthanide contraction. Mention the consequences of lanthanide contraction.

 III) Explain the Monsanto process for the conversion of methanol to acetic acid with its mechanism.

4. A) Explain the 'band theory' of metals with reference to sodium metal. **6**

            OR

A) Answer the following : **6**

   I) Name the essential, trace and ultratrace elements necessary for healthy human life.

  II) What are superconductors ? Mention their uses.

B) Answer the following : **4**

   I) Distinguish between Schottky and Frenkel defects.

  II) List the factors affecting corrosion.

            OR

B) Calculate the lattice energy of NaI from the following data : **4**

ΔH_f of NaI $= -287.6$ kJ mole $^{-1}$

$S_{Na} = + 108.7$ kJ mole $^{-1}$

$I_{Na} = + 493.8$ kJ mole $^{-1}$

$\dfrac{1}{2} D_{I_2} = + 106.6$ kJ mole $^{-1}$

$E.A_{I_2} = - 305.9$ kJ mole $^{-1}$

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T.Y. B.Sc. (Semester – IV) Examination, 2009
CHEMISTRY – III
CH - 343 : Organic Chemistry

Time : 2 Hours   Max. Marks : 40

N.B.: 1) **All** questions are **compulsory**.

2) Figures to the **right** indicate **full** marks.

3) Draw structures and **neat** diagrams, if **necessary**.

4) Spectroscopic data is given in Tables **1**, **2** and **3**.

1. Answer the following :   **10**

   i) How will you prepare pyridinium chlorochromate ?

   ii) What is carbanion ? How is it prepared ?

   iii) Acetaldehyde doesnot undergoes cannizzaro reaction. Explain.

   iv) Calculate fundamental modes of vibrations in CO_2.

   v) Give the sources of alkaloids.

   vi) What are terpenoids ? Why they are called as isoprenoids ?

   vii) Give one synthetic application of SeO_2.

   viii) Explain the term FGI with suitable example.

   ix) Indicate different sets of protons in the molecule $CH_3 – O – CH_2 – CH_2 – O – CH_3$.

   x) Acetaldehyde is more reactive than acetone towards nucleophilic addition reaction. Explain.

P.T.O.

2. a) Attempt **any two** of the following. **6**

   i) Write retrosynthesis and synthesis of
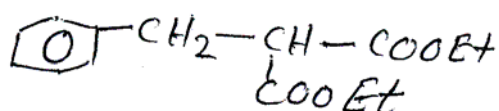
   ii) How will you prepare succinic acid from diethyl malonate ?

   iii) Discuss the mechanism of Aldol condensation with suitable example.

   b) Calculate λ_{max} for the following : **4**

   i)   ii)
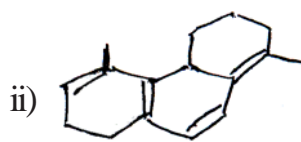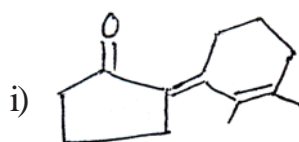
                    OR

   b) i) Write a note on Diekmann cyclisation. **2**

   ii) The hydrate of diphenylpropanetrione is stable. Explain. **2**

3. Attempt **any two** of the following : **10**

   a) i) Give Barbier and Bouveault synthesis of citral.

   ii) Write the reaction to indicate the presence of $-NHCH_3$ group in Ephedrine.

   b) i) Give any two synthetic applications of $NaBH_4$.

   ii) How will you prove the presence of gemdimethyl group in citral ?

   c) i) An organic compound $C_4H_6O_2$ shows IR bands at 3030, 1765 and 1145 cm^{-1}. Find the structure.

   ii) How will you differentiate anisole and metacresol by IR spectroscopy ?

4. a) Propose structures for the compounds from the following spectral data. Justify
   your answer **(any two)** : **6**

   i) Molecular formula : C_3H_6O

   IR : 2720 and 1730 cm^{-1}.

   NMR : a) Singlet at 9.8 δ (2mm)

   b) Quartet at 2.5 δ (4 mm)

   c) Triplet at 1.2 δ (6 mm)

   ii) Molecular formula : $C_9H_{10}O$

   U.V. : λ_{max} 260 and 290 nm.

   IR : 1715, 1590, 1550 and 1460 cm^{-1}.

   NMR : a) Singlet at 2.1 δ (15 mm)

   b) Singlet at 3.6 δ (10 mm)

   c) Singlet at 7.2 δ (25 mm)

   iii) Molecular formula : C_3H_8O

   IR : 3300 cm^{-1}.

   NMR : a) Doublet at 1.1 δ (6 H)

   b) Singlet at 4.8 δ (1 H)

   c) Septet at 3.9 δ (1 H)

b) Predict the product with justification.

i) $\xrightarrow[\text{H}_2\text{SO}_4]{\text{K}_2\text{Cr}_2\text{O}_7}$? $\xrightarrow[\text{Ether}]{\text{LiAlH}_4}$? **2**
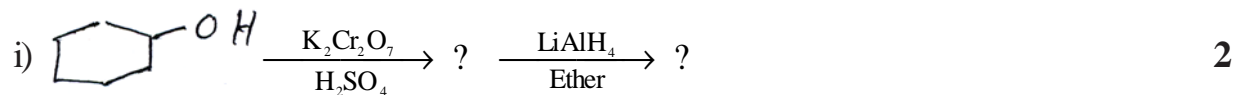
ii) Trans cinnamic acid absorbs at longer wavelength than its cis isomer. Explain. **2**

OR

b) i) Give biogenesis of limonene. **2**

ii) Predict the product with justification. **2**

 $\xrightarrow[\text{H}^\oplus]{\text{K}_2\text{Cr}_2\text{O}_7}$? $\xrightarrow{\text{Ph}_3\text{P}=\text{CH}_2}$?

TABLE – 1
Characteristic Infrared Absorptions of Functional Groups

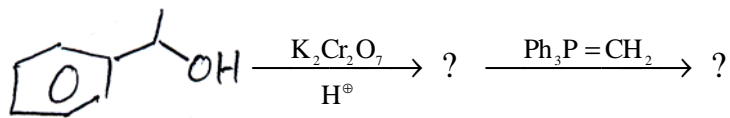| GROUP		FREQUENCY RANGE cm⁻¹	INTENSITY
A.	Alkyl		
	C–H (stretching)	2853–2962	(m – s)
	Isopropyl – $CH(CH_3)_2$	1380 – 1385	(s)
		and 1365 – 1370	(s)
	tert – Butyl – $C(CH_3)_3$	1385 – 1395	(m)
		and – 1365	(s)
B.	Alkenyl		
	C–H (stretching)	3010 – 3095	(m)
	C = C (stretching)	1620 – 1680	(v)
	R–CH = CH_2	985 – 1000	(s)
		and 905 – 920	(s)
	$R_2 C = CH_2$ (out of plane	880 – 900	(s)
	cis – RCH = CHR C–H bendings)	675 – 730	(s)
	trans – RCH = CHR	960 – 975	(s)
C.	Alkynyl		
	≡ C–H (stretching)	– 3300	(s)
	C ≡ C (stretching)	2100 – 2260	(v)
D.	Aromatic		
	Ar – H (stretching)	– 3030	(v)
	Aromatic substitution type		
	(C–H out-of-plane bendings)		
	Monosubstituted	690 – 710	(very s)
		and 730 – 770	(very s)
	o – Disubstituted	735 – 770	(s)
	m – Disubstituted	680 – 725	(s)
		and 750 – 810	(very s)
	p – Disubstituted	800 – 840	(very s)
E.	Alcohols, Phenols, Carboxylic Acids		
	OH (alcohols, phenols, dilute solutions)		
	OH (alcohols, phenols, hydrogen bonded)	3200 – 3550	(broad)
	OH (carboxylic acids, hydrogen bonded)	2500 – 3000	(very broad)
F.	Aldehydes, Ketones, Esters and Carboxylic Acids		
	C = O stretch	1630 – 1780	(s)
	aldehydes	1690 – 1740	(s)
	ketones	1680 – 1750	(s)
	esters	1735 – 1750	(s)
	carboxylic acids	1710 – 1780	(s)
	amides	1630 – 1690	(s)
G.	Amines		
	N – H	3300 – 3500	(m)
H.	Nitriles		
	C ≡ N	2220 – 2260	(m)
I.	$-\overset{\mid}{\underset{\mid}{C}}-O$ stretch (alcohol, ether, phenol)	1000 – 1300	(s)
J.	Nitro N = O	1550 and 1350	(s)
K.	Halides F	1400 – 1000	(s)
	Cl	785 – 540	(s)

TABLE – 2

Approximate Proton Chemical Shifts in NMR

TYPE OF PROTON	CHEMICAL SHIFT, DELTA, PPM (δ)		
1° Alkyl, RCH_3	0.8 – 1.0		
2° Alkyl, RCH_2R	1.2 – 1.4		
3° Alkyl R_3CH	1.4 – 1.7	Ester $R-\underset{\underset{O}{\|\|}}{C}-O-CH_2-R$ 4 to 4.5	
Allylic, $R_2C = C - CH_3$ | R	1.6 – 1.9		
Benzylic, $ArCH_3$	2.2 – 2.5		
Alkyl chloride RCH_2Cl	3.6 – 3.8		
Alkyl bromide, RCH_2Br	3.4 – 3.6		
Alkyl iodide, RCH_2I	3.1 – 3.3		
Ether, $ROCH_2R$	3.3 – 3.9		
Alcohol, $HOCH_2R$	3.3 – 4.0		
Ketone, $R\underset{\underset{O}{\|\|}}{C}CH_3$	2.1 – 2.6	$R-\underset{\underset{O}{\|\|}}{C}-CH_2-$	2.4 δ
		$R-\underset{\underset{O}{\|\|}}{C}-\underset{\underset{\|}{\|}}{C}H-$	2.5 δ
Aldehyde, $R\underset{\underset{O}{\|\|}}{C}H$	9.5 – 9.6		
Vinylic, $R_2C = CH_2$	4.6 – 5.0		
Vinylic $R_2C = CH$ | R	5.2 – 5.7		
Aromatic, ArH	6.0 – 9.5		
Acetylenic, $RC \equiv CH$	2.5 – 3.1		
Alcohol hydroxyl, ROH	0.5 – 6.0[a]		
Carboxylic, $RC\underset{\underset{O}{\|\|}}{O}H$	10 – 13[a]		
Phenolic, ArOH	4.5 – 7.7[a]		
Amino $R-NH_2$	1.0 – 5.0		

[a]The chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE – 3

U.V. Absorption rules for diene chromosphores

1)	Parent	215 nm	6)	– halogen	5 nm
2)	Each extra conjugation	30 nm	7)	– SR	30 nm
3)	Homoannular	39 nm	8)	– NR_2	60 nm
4)	Exocylic double bond	05 nm	9)	– OH, – OR	5 nm
5)	Each alkyl (R) substituent directly attached to double bonded carbon	05 nm			

U.V. Absorption rules for Enone System

1)	Parent	215 nm (207 nm for aldehyde) (202nm for five member ring)			
2)	Each extra conjugation	30 nm	6)	– Cl	α 15 nm
3)	Homoannular	39 nm	7)	– OH, – OR	β 12 nm
4)	Substituents		8)	– SR	α 35 nm
	a) Alkyl group at α	10 nm	9)	– NR_2	β 30 nm
	b) Alkyl group at β	12 nm			β 85 nm
	c) Alkyl group at γ, δ and higher	18 nm			β 95 nm
5)	Exocylic double bond	05 nm			

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T.Y. B.Sc. (Semester – IV) Examination, 2009
CHEMISTRY – IV
CH-344 : Analytical Chemistry

Time : 2 Hours   Max. Marks : 40

N.B. : *1) **All** questions are **compulsory**.*
*2) Figures to the **right** indicate **full** marks.*
*3) Use of log tables and calculators is **allowed**.*
*4) Neat diagram must be drawn **wherever** necessary.*

1. Answer the following :   **10**

   1) What is the function of analyser in polarimeter ?

   2) Give the disadvantages of the zone electrophoresis.

   3) What is critical angle in refractometry ?

   4) Define the term 'Faraday'.

   5) What is electrogravimetry ?

   6) Give the principle of electrophoresis.

   7) What analytical information is obtained from molecular ion peak in mass spectrum ?

   8) Why CO_2 is used as mobile phase for super critical fluid chromatography ?

   9) What is λ_{max} ?

   10) What is supporting electrolyte in polarography ?

2. a) Answer **any two** of the following :   **6**

   1) Discuss any one method of electrophoresis,

   2) For sucrose $[\alpha]_{\lambda}^{t} = +66.5°$. Calculate i) angle of rotation expected for solution containing sucrose at a concentration 50 gm per litre in 20 cm cell and ii) molecular rotation of it.

   [Given molecular weight = 342].

3) What will be the diffusion current of z millimole of cd^{+2} solution. Given :

Diffusion coefficient $= 9 \times 10^{-6}$ $cm^2.s^{-1}$.

Rate of flow of mercury $= 4$ mg. s^{-1}.

Drop time $= 6$ sec.

b) Answer **any two** of the following : **4**

1) Sketch schematic diagram of HPLC appartus.

2) List the factors that affects the optical rotation.

3) Give the qualitative applications of mass spectrometry.

3. Attempt **any two** of the following : **10**

1) Explain any two detector systems used in HPLC.

2) Give the principle of mass spectrometry. Draw diagram of mass spectrometer and explain its working.

3) Define the term electrochemical equivalent. State and explain the Faraday's laws of electrolysis.

4. a) Describe essential components of spectrophotometer with block diagram. Explain the function of each component. **6**

OR

a) Draw the ideal polarographic wave. Explain the terms residual current, limiting current, diffusion current and migration current.

b) A solution of a substance of concentration 2.8×10^{-5} m has absorbance 0.90 at 540 nm, when measured in 1 cm cell. Find the transmittance of 1.52×10^{-5} m of same solution measured at same wavelength but in 0.62 cm cell. **4**

OR

b) Calculate the specific refraction and molar refraction of toluene (mol. wt. = 92) at 20° C.

Given : n_D^{20} $= 1.497$

Density $= 0.866$ $g.cm^{-3}$.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
CHEMISTRY (Paper – V)
CH –345 : Industrial Chemistry

Time: 2 Hours   Max. Marks: 40

N.B. : 1) **All** questions are **compulsory**.
2) *Figures to the* **right** *indicate* **full** *marks*.
3) *Draw* **neat** *diagrams and flowsheets* **wherever** *necessary*.

I. Answer the following :   **10**

    1) Explain the term "Retarder" with reference to cement.

    2) What is composition of Portland cement ?

    3) What is finishing of glass ?

    4) What are fundamental raw materials for making a glass ?

    5) Define the term "colour".

    6) Explain the term "Micelles".

    7) Define the term "Fire point" of fuel.

    8) Define the term "Detergent".

    9) What do you mean by "Tranquilizers" ?

    10) What are antibiotics ? Give one example.

II. A) Answer the following (**any two**) :   **6**

    1) Write note on "Benefication by floatation".

    2) Discuss various raw materials required for manufacture of soaps.

    3) What is calorific value ? How it is determined ?

  B) Answer the following (**any two**) :   **4**

    1) Explain in brief the chemical properties of glass.

    2) Explain the term chromophore and auxochrome with suitable examples.

    3) What are advantages of gaseous fuels ?

III. Attempt **any two** of the following :   **10**

   1) Discuss the manufacture of sheet glass by Fourcault process.

   2) What are dyes ? How are they classified according to their chemical constitution ?

   3) Give synthesis and uses of   i) Sulphanilamide   ii) Benzocaine

IV. A) What is fuel cell ? Give advantages of fuel cells. Describe construction and working of oxygen-hydrogen fuel cell.   **6**

              OR

   A) Describe the dry process of manufacture of cement with flowsheet.   **6**

   B) What are surfactants ? How are they classified ?   **4**

              OR

   B) What are analgesics ? Give manufacture of Aspirin with flowsheet diagram.   **4**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
CHEMISTRY – VI
CH-346 (A) : Nuclear Chemistry

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) *Figures to the* ***right*** *indicate* ***full*** *marks.*
3) *Draw the diagrams* ***whenever*** *necessary.*

1. Answer the following :   **10**

a) The process of Nuclear fission was discovered by _____

   i) Otto Hahn

   ii) F. Strassmann

   iii) Otto Hahn and F. Strassmann

   iv) Fermi

b) What are the prompt and delayed neutrons ?

c) What is the principle of thermoluminescence detector ?

d) Give two disadvantages of Van de Graft accelerator.

e) Which is the moderator in natural uranium reactor ?

f) What is the importance of reproduction factor (K) in the functioning of nuclear reactor ?

g) State one method for the preparation of tritium radioisotope (^{3}H).

h) Which radioisotope is used in the age determination of wooden sample ?

i) What is the function of scintillator in scintillation counter ?

j) Which are the two safety precautions taken while handling radioactive substance ?

2. A) Attempt **any two** of the following :   **6**
   a) Write short note on fission energy.
   b) Give the classification of nuclear reactors.
   c) Write short notes on Szilard-Chalmer reaction.

   B) Answer **any two** of the following :   **4**
   a) Explain radiochemical principles in the use of tracers.
   b) What are the biological effects of radiations ?
   c) Calculate the energy released in the following fission process.

   $$^{239}Pu + n \longrightarrow {}^{108}Pd + {}^{129}Xe + 3n$$

   Given atomic masses of
   $^{239}Pu = 239.0522$ amu
   $n = 1.0087$ amu
   $^{108}Pd = 107.9039$ amu
   $^{129}Xe = 128.9048$ amu.

3. Answer **any two** of the following :   **10**
   a) What are semiconductors ? Which are the different types of semiconductors ? Explain the principle and working of semiconductor detector.
   b) Explain the principle and working of Cock-Croft Walton accelerator with neat diagram.
   c) State and explain the principle of Radiometric titration. Which radioisotope is used in complexometric titration of calcium of EDTA ?

4. A) Explain the discovery of nuclear fission. Explain the distribution of mass and charge in nuclear fission.   **6**
                        OR
   A) Define Reproduction factor (K). Explain the terms involved in four factor formula. Why value of K is kept slightly greater than one ?   **6**

   B) Discuss the method of preparation of the following radio isotopes
   1) Carbon-14
   2) Sodium-22
   3) Iodine-131.   **4**
                        OR
   B) Find the energy of recoil ^{128}I atom following the emission of a 4.8 MeV photon in the (n, γ) reaction on ethyl iodide.   **4**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
CHEMISTRY – VI
CH-346 (B) : Polymer Chemistry

Time : 2 Hours　　　　　　　　　　　　　　　　　　　Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
　　　　　　　　2) Figures to the ***right*** *indicate* ***full*** *marks.*
　　　　　　　　3) Draw the diagrams ***whenever*** *necessary.*
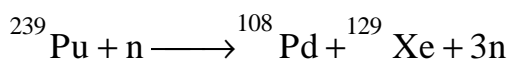
1. Answer the following : **10**

　i) What is repeat unit of polyurathane ?

　ii) Write two uses of malamine-formaldehyde resin.

　iii) Give two examples of photostabilizers.

　iv) What is isotactic polymer ?

　v) Define the degree of crystallinity.

　vi) What is flash ?

　vii) Explain the term plastic.

　viii) Convert the name diethyl-silane-diol to the structure.

　ix) Explain the term-Abresion resistance.

　x) Give the important IR bands in polyvinyl acetate.

2. A) Attempt **any two** of the following : **6**

　i) Explain the role of plasticizer on glass transition temperature.

　ii) Why cis-polybutadiene exhibits good elongation property ?

　iii) Explain Tg of polystyrene is 100°C while polymethyl-α-styrene is 170°C.

　B) Answer the following (**any two**) : **4**

　i) Explain the role of stabilizer to avoid degradation of PVC.

　ii) How will you distinguish polyvinyl alcohol and polyamide polymer by using IR-spectroscopy ?

　iii) Give the importance of polymer processing in polymer industry.

3. Answer **any two** of the following : **10**

   i) Describe optical isomerism and geometrical isomerism in polymers.

   ii) What is the effect of branching in chain of polymer on glass transition temperature ?

   iii) What are silicone fluids ? How they are prepared ? Give the important uses of silicone fluids.

4. A) Write notes on : **6**

   a) Die casting

   b) Blow moulding.

         OR

  A) Describe the methods of preparation, uses and properties of

   a) Urea-formaldehyde resin

   b) Polyvinyl acetate.

  B) Discuss in detail the thermoforming process. **4**

         OR

  B) Describe the compression moulding in detail.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
CHEMISTRY – VI
CH-346 (C) : Biochemistry

Time : 2 Hours   Max. Marks : 40

Instructions : *i) **All** questions are **compulsory**.*
*ii) Figures to the **right** indicate **full** marks.*
*iii) Neat diagrams must be drawn **wherever** necessary.*

1. Answer the following :   **10**

    i) Give the role of co-enzyme NAD^+ with suitable reaction.

    ii) What is catobolic reaction ? Give one example.

    iii) Give the structure of the end product of β-oxidation of fatty acid.

    iv) Define coupled reaction.

    v) What is deamination ?

    vi) Define the term nucleoside.

    vii) Give the structure of any one pyrimidine nucleotide.

    viii) Define exonuclease with one example.

    ix) Give any two name of disease caused by deficiency by Vit.A.

    x) Give the activities of DNA polymerase II.

2. a) Attempt **any two** :   **4**

    i) Give the reaction and name of enzyme involved in conversion of pyruvate to acetyl CoA.

    ii) Discuss the role of carnitine in fatty acid transport.

    iii) Discuss the energetics of TCA cycle.

    b) Answer the following (**any two**) :   **6**

    i) Describe the components of ETC.

    ii) Discuss the structure of DNA polymerase III.

    iii) Give the principle and application of dideoxymethod.

3. Answer the following (**any two**) :   **10**

   i) Explain the irrversible steps and their significance involved in glycolysis.

   ii) Discuss the experimental evidence to prove that DNA as genetic material.

   iii) Describe the structure and significance of chromatin structure.

4. a) Give the properties and importance of genetic code.   **4**

            OR

   a) Describe the importance of restriction enzymes in recombinant DNA technology
      with suitable example.

   b) Describe in detail the reactions involved in TCA cycle.   **6**

            OR

   b) Give a brief account of transcription in E. coli.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
CHEMISTRY – VI
CH-346 (D) : Environmental Chemistry

Time : 2 Hours   Max. Marks : 40

Instructions :   *i)* ***All*** *questions are* ***compulsory***.
   ii) *Figures to the* ***right*** *indicate* ***full*** *marks.*
   iii) *Neat diagrams must be drawn* ***wherever*** *necessary.*
   iv) *Flow sheets/block diagrams and reactions must be given* ***wherever*** *necessary.*

1. Answer the following in short :   **10**

   i) What is the purpose of secondary treatment in waste water treatment ?

   ii) Name the components of lithosphere.

   iii) What is the role of carrier gas in Gas Chromatography ?

   iv) What is integrated environment management ?

   v) What is pyrolysis ?

   vi) Which chemical reagent is used for spectrophotometric determination of sulphur dioxide by Das Gupta Method ?

   vii) What do you mean by ion selective electrodes ?

   viii) What is the role of indicator and reference electrode ?

   ix) Define 'nuclear fission reaction'.

   x) What is meant by soil horizon ?

2. a) Attempt **any two** of the following :   **6**

   i) 'Synthane gasifier'. Explain.

   ii) 'Dihydrogen-dioxygen fuel cell'. Explain.

   iii) 'Reverse Osmosis' explain.

b) Write short notes on (**any two**) : **4**

   i) Green Gas Technology.

   ii) Net protein utilization.

   iii) Non conventional energy sources.

3. Attempt **any two** of the following in detail. **10**

   i) Discuss organic and inorganic components of soil.

   ii) Describe upflow anaerobic sludge bed treatment method for purification of waste water.

   iii) Discuss in brief spectrophotometry.

4. a) Describe in detail any one of the tertiary treatment method for industrial waste water. **6**

            OR

  a) Describe principle and working of AAS.

  b) Write short note on (**any one**) : **4**

   i) Electrodialysis membrane technique.

   ii) Treatment of drinking water supply.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
CHEMISTRY – VI
CH-346 (F) : Medicinal Chemistry

Time : 2 Hours
Max. Marks : 40

N.B. :   *i)* ***All*** *questions are* ***compulsory****.*
       ii) Figures to ***right*** *indicate* ***full*** *marks.*

1. Explain the following terms in brief :   **10**

    i) Agonist

    ii) Pain

    iii) Carcinogen

    iv) HIV

    v) Hypertension

    vi) Antimitotics

    vii) Antibiotic

    viii) Depression

    ix) Receptor

    x) HTS.

2. A) Answer **any two** of the following :   **6**

    i) Discuss the role of computers in drug design.

    ii) Explain the concept of combinatorial chemistry and its application.

    iii) Discuss in brief QSAR.

   B) Answer **any two** of the following :   **4**

    i) Discuss in brief selective toxicity.

    ii) Explain the concept of prodrugs with application.

    iii) Discuss the mechanisms of drug resistance.

3. Answer **any two** of the following :   **10**

   i) Explain in brief nerve conduction, clearly explain role of neurotransmitters.

   ii) Discuss in brief Hypertension or Myocardial infarction and its management.

   iii) Discuss in brief the development of β-lactam antibiotics, starting from Penicillin G. Explain the advantages of these semisynthetic derivatives.

4. Answer **any two** of the following :   **10**

   i) Discuss in brief viral life cycle and some drugs affecting it.

   ii) How do the following exhibit their effect as anticancer agents :
      a) Intercalators
      b) Alkylating agents
      c) Antimetabolites

   iii) Describe the use of following drugs :
      a) Ketoconazole
      b) Dapsone
      c) Ibuprofen
      d) Ciprofloxacin
      e) Chloroquine.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
BOTANY (Paper – I)
Biology of Seed Plants – II
BO – 341 : (Gymnosperms and Palaeobotany)

Time : 2 Hours   Max. Marks : 40

Instructions** : i)* ***All *questions are* ***compulsory**.*
ii) ***All*** *questions carry* ***equal*** *marks.*
iii) Neat diagrams must be drawn ***wherever*** *necessary.*

1. Answer the following :   **10**

   a) Which type of wood is found in <u>Pinus</u> ?

   b) What is mean by direct pollination ?

   c) What is <u>Pentoxylon</u> ?

   d) Name the genus belonging to order Cycadales.

   e) Give any two salient features of order Lepidodendrales.

   f) Define fossil.

   g) Mention any two salient features of order Genetales.

   h) What is Petrifaction ?

   i) Give any two morphological features of <u>Gnetum</u> leaf.

   j) Write any two differences between Gymnosperms and Angiosperms.

2. Attempt **any two** of the following :   **10**

   a) What is fertilization ? Explain fertilization in <u>Pinus</u>.

   b) Describe in detail the concept of Geological Time Scale.

   c) Give the economic importance of Gymnosperms.

3. Write short notes on **any two** of the following : **10**

   a) Male cone of <u>Zamia</u>.

   b) <u>Stigmaria</u>.

   c) External morphology of <u>Rhynia</u>.

4. Sketch, label and describe external and internal structure of <u>Pinus </u>needle. **10**

              OR

Give salient features of order Calamitales. Describe external and internal structure of <u>Calamites</u>. **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
BOTANY – II
(Biology of Seed Plants – III)
BO-342 : (Anatomy and Embryology)

Time : 2 Hours   Max. Marks : 40

Instructions :   *1)* ***All*** *questions are* ***compulsory.***
                2) Draw ***neat*** *labelled diagrams* ***wherever*** *necessary.*
                3) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Answer the following :   **10**

    a) Name one mechanical tissue in plant body.

    b) What is maceration technique ?

    c) What is the bark ?

    d) What is anomalous secondary growth ?

    e) Name one principle involved in mechanical tissue system.

    f) What is monosporic embryo sac ?

    g) What is chalazogamy ?

    h) Name any one type of ovule found in Angiosperms.

    i) Sketch and label Helobial type of endosperm.

    j) What is double fertilization ?

2. Attempt **any two** of the following :   **10**

    a) What are stomata ? Describe any two types of stomata.

    b) Describe the structure of lenticel.

    c) Explain the development of <u>Peperomia</u> type of embryo sac.

3. Write notes on (**any two**) : **10**

   a) Microsporogenesis and its types.

   b) Types of megaspore tetrads.

   c) Double staining technique.

4. What is secondary growth ? Explain in detail the process of normal secondary growth in perennial dicot stem. **10**

   OR

4. Describe in detail the internal structure of tetrasporangiate anther. Add note on the types and functions of tapetum. **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
BOTANY
Paper – III – BO-343 : Plant Physiology and Biochemistry

Time : 2 Hours   Max. Marks : 40

N.B. : *i)* ***All*** *questions are* ***compulsory.***
             ii) Draw neat labelled diagrams ***wherever*** *necessary.*
             iii) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Answer the following :   **10**

   a) State any two examples of CAM plants.

   b) Define R.Q.

   c) What is translocation of organic solutes ?

   d) Define monocarpic senescence.

   e) What is seed dormancy ?

   f) Define amino acids.

   g) What are conjugated proteins ?

   h) Give any two examples of polysaccharides.

   i) What is dehydrogenase enzyme ?

   j) Define secondary metabolites.

2. Attempt **any two** of the following :   **10**

   a) Explain ETS in mitochondria.

   b) Discuss the physiological and biochemical changes occur during senescence.

   c) What are lipids ? Give the classification of lipids.

3. Write notes on **any two** of the following :   **10**

   a) Causes of seed dormancy.

   b) Structure of DNA.

   c) Transamination.

4. Define photosynthesis. Write an equation of photosynthesis. Explain the synthesis of various sugars in the calvin cycle. Give significance of calvin cycle.   **10**

                        OR

   What are enzymes ? Give the properties of enzymes and add a note on their classification.   **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
BOTANY (Paper – IV)
BO – 344 : Genetics and Plant Breeding

Time : 2 Hours   Max. Marks : 40

Instructions. : *i)* ***All*** *questions are* ***compulsory***.
ii) Figures to the ***right*** *indicate* ***full*** *marks.*
iii) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

1. Answer the following :   **10**

    i) Name the plants in which XX-XY system of sex chromosome is observed.

    ii) Give the ratio of recessive epistasis.

    iii) What is transition mutation ?

    iv) What is reciprocal cross ?

    v) Define monosomic.

    vi) Mention any two 'Y' linked traits in Man.

    vii) How would you distinguish whether the inheritance of a trait is Multigenic OR Multiallelic ?

    viii) What is mutagen ? Name any two mutagens.

    ix) Define – hybridization.

    x) What is acclimatization ?

2. Answer **any two** of the following :   **10**

    i) Explain multiple allelism with suitable example.

    ii) What is ploidy ? Write about the origin and behaviour of Nullisomic.

    iii) Explain dominance hypothesis with its limitations.

P.T.O.

3. Write notes on **any two** of the following :   **10**

   i) Test cross with suitable example and its significance.

   ii) Contribution made by Nilson-Ehle.

   iii) Different objectives of plant Breeding.

4. Define linkage. Write about the discovery of linkage and add a note on its significance.   **10**

              OR

What is selection ? Explain the procedure of "Pure line selection" giving its merits and limitations.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
BOTANY (Paper – V)
BO-345 : Molecular Biology and Biotechnology

Time : 2 Hours   Max. Marks : 40

N.B.: *i) **All** questions are **compulsory**.*
            *ii) Draw **neat** labelled diagrams **wherever** necessary.*
            *iii) Figures to the **right** indicate **full** marks.*

1. Answer the following :   **10**

    a) What is gene library ?

    b) Define genetic code.

    c) What is organogenesis ?

    d) Define totipotency ?

    e) Give any two differences between prokaryotic and eukaryotic gene organization.

    f) What do you mean by GMP ?

    g) Write significance of Southern blotting.

    h) Name any two types of replication mechanisms in DNA.

    i) What is inducible enzyme ?

    j) Give any two features of 'A' form of DNA.

2. Attempt **any two** of the following :   **10**

    a) Write the significance of cytoplasmic hybrids.

    b) Give the role of t-RNA in translation.

    c) Explain any two applications of molecular biology.

3. Write notes on **any two** of the following : **10**

   a) Dark excision repair mechanism of DNA.

   b) Microinjection.

   c) Somatic embryogenesis.

4. What is PCR ? Explain mechanism of PCR and add a note on its importance. **10**

                OR

4. Define translation. Write about structure and role of ribosomes in translation. **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
BOTANY (Paper–VI)
(Optional Paper)
BO – 346 (A) : Mushroom Technology

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* **All** *questions are* **compulsory.**
                              2) Draw neat labelled diagrams **wherever** *necessary.*
                              3) Figures to the **right** *indicate* **full** *marks.*

1. Answer the following :   **10**
   a) Write the botanical name of button mushroom.
   b) What is spawn ?
   c) Give botanical name of any one poisonous mushroom.
   d) Mushrooms are called as 'Vegeterian meat'. Why ?
   e) Enlist any two sterilization methods of compost.
   f) Give nutritional composition of oyster mushroom.
   g) Give any two types of mushroom spawn.
   h) Why preservation of mushroom is necessary ?
   i) Define casing.
   j) Mushrooms are heterotrophic in nature. Why ?

2. Attempt **any two** of the following :   **10**
   a) Distinguish between edible and poisonous mushroom.
   b) Write morphology of paddy straw mushroom.
   c) Explain various methods of spawning.

3. Write short notes on **any two** of the following :   **10**
   a) Nutritional importance of mushroom
   b) Long term preservation of mushroom
   c) Growth requirements of button mushroom.

4. Explain different fungal and bacterial diseases of mushroom.   **10**

                              OR

   Describe harvesting, grading, packing and transport of mushroom.   **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
BOTANY (Paper–VI)
(Optional Paper)
BO – 346 (B) : Polyhouse Technology

Time : 2 Hours 　　　　　　　　　　　　　　　　　　　　　　Max. Marks : 40

Instructions :　*i) **All** questions are **compulsory**.*
　　　　　　　　*ii) Draw neat labelled diagrams **wherever** necessary.*
　　　　　　　　*iii) Figures to the **right** indicate **full** marks.*

1. Answer the following : 　　　　　　　　　　　　　　　　　　　　**10**
   a) What is Commercial floriculture ?
   b) Give the significance of C:N ratio in root media.
   c) Why replacement of root medium is necessary ?
   d) Write about intercultural practices in tomato.
   e) What are the criteria used for selection of root media components ?
   f) Write about post harvest handling of Roses.
   g) Enlist the chemicals used for sterilization of root media.
   h) Give the spacing distance of carnation cultivation.
   i) Enlist the capital requirements of polyhouse production.
   j) Write any two names of diseases of Roses.

2. Attempt **any two** of the following : 　　　　　　　　　　　　　**10**
   a) Explain how climatic factors are controlled in polyhouse ?
   b) Write about packing and transporting of carnation flowers.
   c) Describe moisture retention as a property of growth medium.

3. Write short notes on **any two** of the following : 　　　　　　　**10**
   a) Limitations of polyhouse technology.
   b) Nutritional requirements of Simla mirch in polyhouse.
   c) Grading in carnation flowers.

4. Define root medium. Describe the principles of root media formulation in detail.　**10**

　　　　　　　　OR

   Describe the various steps involved in cultivation of Gerbera in polyhouse.　**10**

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[3617] – 426

T.Y. B.Sc. (Semester – IV) Examination, 2009
BOTANY (Paper–VI)
(Optional Paper)
BO – 346 (C) : Medicobotany

Time : 2 Hours   Max. Marks : 40

Instructions : *i)* ***All*** *questions are* ***compulsory****.*
ii) Draw neat and labelled diagrams ***wherever*** *necessary.*
iii) Figures to the ***right*** *indicates* ***full*** *marks.*

1. Answer the following :   **10**
   a) Define pharmacognosy.
   b) Give any two uses of Kadha.
   c) Give any two advantages of microscopical mounts of drug.
   d) What are Alkaloids ?
   e) Give any two therapeutic uses of Claviceps.
   f) Write botanical source of clove.
   g) Write two traditional medicinal uses of Tribulus terestris.
   h) Enlist medicinal importance of Ephedra.
   i) Name two plants used in herbal cosmetics.
   j) Write any two methods of Ex-situ conservation.

2. Attempt **any two** of the following :   **10**
   a) Write the procedure of Guti and give its medicinal uses.
   b) Describe therapeutic uses and administration of Digitalis.
   c) Enlist traditional medicinal uses of Ocimum sanctum and Centella asiatica.

3. Write notes on **any two** of the following :   **10**
   a) Therapeutic uses and administration of Aloe.
   b) In-situ conservation.
   c) Methods of extraction of essential oils.

4. Give botanical source, ethanomedicinal and traditional uses of Terminalia arjuna
   and Nutmeg.   **10**

                            OR

   Mention cultivation practices w.r.t. season, soil, propagation, harvesting and

   medicinal uses of Pudina.   **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
ZOOLOGY (Paper – I)
ZO – 341 : Genetics

Time : 2 Hours　　　　　　　　　　　　　　　　　　　Max. Marks : 40

N.B. :　1) **All** questions are **compulsory**.
　　　　2) *Neat, labelled diagram must be drawn* **wherever** *necessary.*
　　　　3) *Figures to the* **right** *indicate* **full** *marks.*

1. Attempt the following :　　　　　　　　　　　　　　　　　　**10**

　　1) Define gene frequency.

　　2) What are somatic mutations ?

　　3) Define monoclonal antibodies.

　　4) Define homozygous condition.

　　5) What are transgenic animals ?

　　6) What is inbreeding ?

　　7) What is chromosome map ?

　　8) Define phenotype.

　　9) What is genetic drift ?

　　10) What is incomplete linkage ?

2. Attempt **any two** of the following :　　　　　　　　　　　　**10**

　　i) What is hybrid vigour ? State its applications.

　　ii) What is somatic cell hybridization ? Illustrate with suitable example.

　　iii) Describe complimentary interaction of gene.

3. Write notes on **any two** of the following : **10**

   a) Law of independent assortment.

   b) One gene one enzyme hypothesis.

   c) Steps involved in genetic engineering.

   d) Klinefelter's syndrome.

4. Define Mendelian population and gene pool. Describe in brief the factors responsible for conservation of gene frequency in population. **10**

                    OR

4. What is crossing over ? Describe the mechanism of crossing over and add a note on its importance. **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
ZOOLOGY
Paper – II : ZO-342 : Physiology and Endocrinology of Mammals

Time : 2 Hours   Max. Marks : 40

N.B. : i) *All* questions are *compulsory*.
ii) *Neat labelled diagrams must be drawn **wherever** necessary.*
iii) *Figures to the **right** indicate **full** marks.*

1. Attempt the following :   **10**

   1) What is cardiac cycle ?

   2) Define RQ.

   3) What is isometric contraction ?

   4) Define menstrual cycle.

   5) What are heart sounds ?

   6) What is glycolysis ?

   7) Define synapse.

   8) What is active transport ?

   9) Define catabolism.

   10) What is exophthalmic goiter ?

2. Attempt **any two** of the following :   **10**

   i) Describe simple muscle twitch with suitable diagram.

   ii) Explain the roles of thyroid hormones.

   iii) Explain ultrafiltration in renal corpuscle.

3. Write notes on **any two** of the following : **10**

   a) Basal Metabolic Rate (BMR)

   b) Cardiac output

   c) Functions of mineralocorticoids

   d) Roel of progesterone in pregnenacy

4. Describe in detail the physiology of digestion. **10**

   OR

   Explain origin and conduction of nerve impulse. **10**

_____

T.Y. B.Sc. (Semester – IV) Examination, 2009
ZOOLOGY (Paper – III)
ZO-343 : Zoogeography, Palaeontology and Evolution
(New Course)

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* **All** *questions are* **compulsory**.
        2) **Neat** *labelled diagrams must be drawn* **wherever** *necessary.*
        3) Figures to the **right** *indicate* **full** *marks.*

1. Attempt the following :   **10**

    1) Define evolution.

    2) What are analogous organs ?

    3) State any two differences between man and ape.

    4) What is a deme ?

    5) Define mimicry.

    6) Who proposed the theory of chemical evolution ?

    7) State principle of precipitin test.

    8) Define species.

    9) What are fossils ?

    10) In which zoogeographic realm India is included ?

2. Attempt **any two** of the following :   **10**

    i) Explain how embryological evidences support organic evolution.

    ii) Enlist conditions that favour fossilization.

    iii) Describe faunal peculiarities of the Australian realm.

3. Write notes on **any two** of the following :   **10**

   a) Biochemical evidences for organic evolution.

   b) Homo erectus.

   c) Carbon dating method.

   d) Batesian mimicry.

4. What is reproductive isolation ? Explain with suitable example any three prezygotic
   isolating mechanisms.

                          OR

4. Give an account of Lamarck's theory of inheritance of acquired characters and
   state objections to it.   **10**

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½

T.Y. B.Sc. (Semester – IV) Examination, 2009
ZOOLOGY (Paper – III)
ZO-343 : Zoogeography, Palaeontology and Evolution
(Old Course)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) ***All*** *questions are* ***compulsory***.
2) ***Neat*** *labelled diagrams must be drawn* ***wherever*** *necessary.*
3) *Figures to the* ***right*** *indicate* ***full*** *marks.*

1. Attempt the following :   **10**

   1) What is cosmic evolution ?

   2) Define deme.

   3) What are antibodies ?

   4) Define discontinuous distribution.

   5) Who proposed mutational theory of organic evolution ?

   6) Name any two post zygotic isolating mechanisms.

   7) Define fossil.

   8) Name the nearest ancestor of modern man.

   9) Define mimicry.

   10) The world is divided into how many zoogeographic realms ?

2. Attempt **any two** of the following :   **10**

   i) Explain conditions that favour fossil formation.

   ii) Give an account of oparin's theory of origin of life.

   iii) Explain how embryological evidences support organic evolution.

3. Write notes on **any two** of the following : **10**

   a) Sympatric speciation.

   b) Carbon dating method.

   c) Neanderthal man.

   d) Faunal peculiarities of the oriental realm.

4. Describe different modifications found in animals that live in deserts. **10**

   OR

4. Give an account of Lamarck's theory of organic evolution and critically evaluate it. **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
ZOOLOGY (Paper – IV)
ZO-344(a) : Economic Entomology

Time : 2 Hours   Max. Marks : 40

N.B.: *i)* ***All*** *questions are* ***compulsory****.*
ii) *Draw neat labelled diagrams* ***wherever*** *necessary.*
iii) *Figures to the* ***right*** *indicate* ***full*** *marks.*

1. Attempt the following :   **10**
   1) What is veterinary entomology ?
   2) Define the term 'pest'.
   3) What are leaf miners ?
   4) What is a 'biological weapon' ?
   5) What is IPM ?
   6) What is myiasis ?
   7) What is 'cotton stainer' ?
   8) State any two examples of insect pests of vegetable plants.
   9) What are ant cows ?
   10) Food grains should be properly sundried before storage why ?

2. Attempt **any two** of the following :   **10**
   i) Describe the nature of damage and control measures of Blow fly.
   ii) Explain how insects are useful in biocontrol of pests.
   iii) Describe the nature of damage and control measures for any two important insect pests of forest plants.

3. Write nature of damage and control measures of **any two** of the following :   **10**
   a) Jawar stem borer
   b) Pomegranate fruit borer
   c) Pulse beetle
   d) Pink boll worm.

4. Describe with suitable examples the damage caused by insect borers and surface feeding insects.   **10**
                    OR
4. Explain the role of insects in lac production. Add a note on composition and uses of lac.   **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
ZOOLOGY (Paper – IV)
ZO-344(b) : Public Health and Hygiene

Time : 2 Hours   Max. Marks : 40

N.B.: 1) **All** questions are **compulsory**.
2) *Neat labelled diagrams must be drawn **wherever** necessary.*
3) *Figures to the **right** indicate **full** marks.*

1. Attempt the following :   **10**
   1) Define community health.
   2) What is air pollution ?
   3) What is balanced diet ?
   4) Define droplet infection.
   5) Name any two sources of water pollution.
   6) What is vital statistics ?
   7) What is meant by drug ?
   8) Define sanitary well.
   9) What are occupational diseases ?
   10) Enlist man-made sources of radiation.

2. Attempt **any two** of the following :   **10**
   i) Describe the artificial ventilation.
   ii) Explain any two methods of water purification on small scale.
   iii) Give an account of refuse disposal.

3. Write notes on **any two** of the following :   **10**
   a) Soil pollution
   b) Cockroach as a pest
   c) Any two methods of food preservation
   d) Alcoholism.

4. Explain the signs, symptoms, mode of transmission and control measures of
   amoebic dysentery.   **10**
                                OR
4. Describe various specifications to be taken into account while constructing a
   good residential house from hygienic point of view.   **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
ZOOLOGY (Paper – IV)
ZO-344(c) : Aquaculture

Time : 2 Hours   Max. Marks : 40

N.B.: *1)* **All** *questions are* **compulsory**.
        2) Neat labelled diagrams must be drawn **wherever** *necessary.*
        3) Figures to the **right** *indicate* **full** *marks.*

1. Attempt the following :   **10**

   1) What is pond cage culture ?

   2) State the scientific name of prawn.

   3) Name any two fish by-products.

   4) What is paddy-cum-fish culture ?

   5) Name any two fishes used in biological control.

   6) What is fish manure ?

   7) Mention the importance of aerator in aquarium.

   8) Define transgenic fish.

   9) Name any two protozoan parasites of fishes.

   10) State the importance of crustaceans in aquaculture.

2. Attempt **any two** of the following :   **10**

   i) Explain in brief the different types of criteria used for site selection in aquaculture.

   ii) Explain the process of marketing of ornamental fishes.

   iii) Explain the importance of inorganic manures in pond fertilization.

3. Write short notes on **any two** of the following : **10**

   a) Species suitability for aquaculture.

   b) Role of extension agencies in aquaculture.

   c) Fish fungal diseases and their control measures.

   d) Fish culture in waste water.

4. Explain the harvesting methods of shell fishes with suitable examples. **10**

                    OR

4. What is integrated farming ? Explain its objectives and importance in relation
   with animal husbandry. **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
ZOOLOGY
Paper – V : ZO-345 : Molecular Biology

Time : 2 Hours

Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
2) Neat **labelled** diagrams must be drawn **wherever** necessary.
3) Figures to the **right** indicate **full** marks.

1. Attempt the following : **10**

    1) Define Heterochromatin.

    2) State any two characteristics of A. DNA.

    3) What is PCR ?

    4) What are regulatory genes ?

    5) Define Intron.

    6) What is a polyribosome ?

    7) What is a sigma factor ?

    8) Define translation.

    9) Name any two stop codons.

    10) Name the pyrimidine bases in RNA.

2. Attempt **any two** of the following : **10**
    i) What is genetic code ? State properties of genetic code.
    ii) Explain the structure of nucleosome.
    iii) Describe post transcriptional modifications during m-RNA synthesis.

3. Write notes on **any two** of the following : **10**

   a) Southern blotting.

   b) Cloning vectors.

   c) t-RNA.

   d) Trp-operon.

4. Explain the process of bacterial conjugation. **10**

                    OR

4. What is DNA replication ? Explain the molecular process of replication. **10**

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T. Y. B.Sc. (Sem. – IV) Examination, 2009
ZOOLOGY (Paper – VI)
ZO – 346 : Developmental Biology

Time : 2 Hours   Max. Marks : 40

N.B : *1)* **All** *questions are* **compulsory**.
2) **Neat,** *labelled diagrams must be drawn* **wherever**
necessary.
3) *Figures to the* **right** *indicate* **full** *marks.*

1. Attempt the following :   **10**

    1) Define epigenesis.

    2) What is differentiation ?

    3) What is a telolecithal egg ?

    4) Define cloning.

    5) What is capacitation ?

    6) Define torsion.

    7) What is a polar body ?

    8) What is cleavage ?

    9) What is induction ?

    10) Define morula.

2. Attempt **any two** of the following :   **10**

    i) Describe phases of spermatogenesis.

    ii) Describe primitive streak stage of chick.

    iii) With suitable diagram, describe grastrula of frog.

3. Write notes on **any two** of the following : **10**

   a) Blastulation in chick

   b) Vitellogenesis

   c) Organizers

   d) Holoblastic cleavage.

4. Describe the development of brain of chick upto 72 hours of incubation. **10**

                    OR

4. Define fertilization. Describe the process of fertilization. **10**

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T.Y. B.Sc. (Sem.–IV) Examination, 2009
GEOLOGY (Paper–I)
GL – 341 : Indian Stratigraphy – II

Time : 2 Hours   Max. Marks : 40

***Instructions** : 1) **All** questions are **compulsory**.*
*2) Black figures to the **right** indicate **full** marks.*
*3) Neat diagrams must be drawn **wherever** necessary.*

1. Answer the following questions in **2/3** lines.   **10**

   a) Name 2 important fossils of permo-carboniferous rocks.

   b) Give the economic importance of Tertiary rocks of K-G basin.

   c) Name important fossils of inter-trappeans.

   d) Name the different stages of Siwaliks.

   e) What is the age of marine transgression along the west coast of India.

   f) Give the stratigraphy of Bagh beds.

   g) What are 'Molassae facies' ?

   h) Name any two fossils from Cambrians of Spiti valley.

   i) Name two important mega-fossils of Siwaliks.

   j) Name two important geological events of silurian period.

2. Write notes on (**any two**) :   **10**

   a) Tectonics during Tertiary

   b) K-T Boundary

   c) Jurassic of Kutch.

3. Answer the following (**any two**) :   **10**

    a) Describe the Intertrappeans.

    b) Petrographical characters of Deccan Traps.

    c) Describe the lithology of Karewas of Kashmir.

4. Give the type area, broad lithology, fossil content and classification of Gondwana Super Group.   **10**

                    OR

    Tertiaries of Assam.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
GEOLOGY (Paper – II)
GL-342 : Petrology – II

Time : 2 Hours

Max. Marks : 40

Instructions : 1) **All** questions are **compulsory**.
2) Black figures to the **right** indicate **full** marks.
3) Neat diagrams must be drawn **wherever** necessary.

1. Answer the following : **10**

   a) Give any two factors controlling the textures of sedimentary rocks.

   b) Define anisotropic fabric pattern.

   c) Give example of a binary system with incongruently melting compounds.

   d) Define Normative minerals.

   e) Give any two chemical structures.

   f) Define stability of minerals.

   g) Give the two major aspects of sedimentary tectonics.

   h) Give any two modes of occurrence of pegmatites.

   i) Define peraluminous granite.

   j) Define roundness.

2. Write notes on (**any two**) : **10**

   a) CIPW classification of Igneous rocks.

   b) Folk's classification of limestone.

   c) Ripple marks.

3. Write notes on (**any two**) : **10**

   a) Peridotites

   b) Grade scale

   c) Heavy mineral zones.

4. Define the term provenance. Describe textural and mineralogical maturity. **10**

   OR

   What is sieve analysis ? Describe the procedure, interpretation and plotting with
   suitable examples. **10**

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T.Y.B.Sc. (Sem. – IV) Examination, 2009
GEOLOGY (Paper – III)
GL-343 : Geotectonics Geology

Time : 2 Hours   Max. Marks : 40

Instructions : 1) **All** questions are **compulsory**.
2) *Black figures to the* ***right*** *indicate* ***full*** *marks.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

1. Answer the following questions in **2/3** lines :   **10**
   a) What is Magnetic inclination ?
   b) What are Benioff Zone's ?
   c) Give 2 important types of Mountains.
   d) Give 2 important characteristics of the Core.
   e) Name 2 important types of plate boundaries.
   f) What is meant by the term 'epeirogenesis' ?
   g) Which type of collision has given rise to Himalayas ?
   h) Who proposed 'Sea-floor Spreading hypothesis' ?
   i) Explain the utility of DRM.
   j) Give the important characteristics of P-waves.

2. Write notes on (**any two**) :   **10**
   a) What are plate boundaries ?
   b) Describe the types of convergent plate boundaries.
   c) Causes and effects of Magnetic reversals.

3. Answer the following (**any two**) :   **10**
   a) Plutonism and metamorphism.
   b) Thermal cycle hypothesis.
   c) Triple Junction.

4. Define 'back-arc basins' and explain their origin with the help of entrapment and
   lateral drift theories.   **10**

                           OR

   Describe the mechanism of 'plate motion' due to convection mechanism and
   thermal boundary layer concept.

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
GEOLOGY (Paper – IV)
GL - 344 : Economic Geology – II

Time : 2 Hours Max. Marks : 40

Instructions : 1) **All** questions are **compulsory**.
2) *Neat diagrams must be drawn **wherever** necessary.*
3) *Black figures to the **right** indicate **full** marks.*

1. Answer the following questions in **2-3** lines : **10**

   a) Name any four semi-precious stones.

   b) Name the two important oxides of Uranium.

   c) What is the speciality of Fire Clay ?

   d) State the chief ore minerals of Silver.

   e) Name the two commercial varieties of Mica.

   f) State the important localities of Kyanite deposits in India.

   g) Name the Acid Refractory minerals.

   h) Name two Ore minerals of Copper.

   i) Who manages the mineral resources in India ?

   j) What is meant by "Wet-steam" ?

2. Write notes on (**any two**) : **10**

   a) Pre-feasibility study.

   b) Khetri Copper Belt.

   c) Geo-pressurized zones.

P.T.O.

3. Answer the following (**any two**) :   **10**

   a) Give geological distribution of Magnesite deposits in India. Add a note on uses of Magnesite.

   b) Describe the mineralogy and geographical distribution of chromite deposits in India.

   c) Precious gemstones.

4. What precautionary measures are necessary for protecting the Ecology of mining area ?   **10**

                    OR

4. Give the mineralogy, geological and geographical distribution of Manganese deposits in India. Add a note on uses of Manganese.   **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
GEOLOGY (Paper – V)
GL-345 : Natural Resource Management

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
                      2) Black figures to the ***right*** *indicate* ***full*** *marks.*
                      3) Neat diagrams must be drawn ***wherever*** *necessary.*

1. Answer the following questions in **2-3** lines.   **10**
   a) Define non-conventional energy sources.
   b) What is drift theory of coal genesis ?
   c) Name two important lower Gondwana coal fields.
   d) What is land capability index ?
   e) What do you mean by watershed ?
   f) What is water table ?
   g) Define aquifuge.
   h) Give two important causes of soil deterioration.
   i) What is Darcy's law ?
   j) What is pearched aquifer ?

2. Write notes on **any two** :   **10**
   a) Coal fields of Maharashtra.
   b) Occurrence of groundwater.
   c) Finite nature of natural resources.

3. Write notes on **any two** :   **10**
   a) Classification of soil.
   b) Inpact of landuse on soil resources.
   c) Rain water harvesting.

4. What do you mean by migration of oil ? Explain in detail structural and stratigraphic
   traps.   **10**
                      OR
   Explain the vertical distribution of groundwater. Add a note on conservation of
   ground water.   **10**

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
GEOLOGY
Paper – VI : GL - 346 : Principles of Remote Sensing, Photogeology and
Geographical Information System (GIS)

Time : 2 Hours   Max. Marks : 40

Instructions : 1) *All* questions are *compulsory*.
2) *Black figures to the* ***right*** *indicate* ***full*** *marks.*
3) *Neat diagrams must be drawn* ***wherever*** *necessary.*

1. Answer the following in **two/three** lines :   **10**

   a) What is passive remote sensing system ?

   b) What are the types of reflectors ?

   c) What is Nadir point ?

   d) Give the spectral bandwidth of near IR waves.

   e) What is dendritic drainage pattern ?

   f) What is tone of aerial photograph ?

   g) State any two functional groups of GIS software.

   h) What is point feature ?

   i) What is projection in GIS ?

   j) State two ways by which spatial data in GIS is represented.

2. Answer the following (**any two**) :   **10**

   a) Explain the applications of remote sensing in forestry.

   b) Give the photogeologic characters of granite.

   c) Explain raster data model.

P.T.O.

3. Write notes on **any two** :   **10**

   a) An ideal remote sensing system.

   b) Criteria for lithological interpretation.

   c) Proximity analysis.

4. Enumerate various photorecognition elements used while interpreting the aerial
   photographs. Explain any three of them in detail.   **10**

                        OR

   What do you mean by projection ? Give the classification of projections based
   upon

   a) Developable surface area

   b) Methods of construction.   **10**

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
STATISTICS (Principal) (Paper – I)
ST-341 : Distribution Theory – II

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
               2) Figures to the ***right*** *indicate* ***full*** *marks.*
               3) Use of scientific calculator and statistical tables is ***allowed****.*
               4) Symbols and abbreviations have their ***usual*** *meaning.*

1. a) Choose the correct alternative in **each** of the following :   **(1 each)**

   i) If $X \sim C(\mu, \lambda)$, then quartile deviation of X is

     A) $(\mu + \lambda)\big/2$ B) λ C) μ D) $\mu + \lambda$

   ii) If $(X, Y) \sim BN(1, 2, 9, 16, 0.5)$, then $Var(Y | X = x)$ is

     A) 12   B) 6.75   C) 16   D) 9

   iii) If $X \sim L(\mu = 4, \lambda = 2)$, then Bowley's coefficient of skewness is

     A) 1   B) –1   C) $\frac{1}{2}$ D) 0

   iv) If $X \sim LN(2, 3, 4)$, then mode of X is

     A) $2 + e^{-1}$ B) $2 + e$ C) $3 + e^{-2}$ D) $4 + e^2$

  b) State whether **each** of the following statements is **true** or **false** :   **(1 each)**

   i) If $X \sim C(\mu, \lambda)$, then the distribution of X is symmetric about mode.

   ii) The n step transition probability matrix is the $(n - 1)^{th}$ power of P.

  c) i) Define a stochastic matrix P.

   ii) Define a one step transition probability.   **(1 each)**

  d) i) State the relationship between Bivariate normal and Cauchy distribution.

   ii) Sketch the nature of probability curve of Laplace distribution.   **(1 each)**

2. Attempt **any two** of the following : **(5 each)**

   a) Let $X \sim B(n, p)$. If the distribution of X is truncated at $X = 0$, state the p.m.f of resulting distribution. Obtain its mean and variance.

   b) Let $(X, Y) \sim BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$. Prove that X and Y are independent if and only if X and Y are uncorrelated.

   c) Let $\{X_n, n \geq 0\}$ be a Markov chain (M.C.) with state space $S = \{0, 1, 2\}$. Initial probability distribution is given by $P(X_0 = 0) = 0.3$, $P(X_0 = 1) = 0.5$ and $P(X_0 = 2) = 0.2$. Stochastic matrix P is given by

   $$P = \begin{bmatrix} 0.2 & 0.35 & 0.45 \\ 0.3 & 0.3 & 0.4 \\ 0.2 & 0.4 & 0.4 \end{bmatrix}$$

   Compute :

   i) $P(X_0 = 0, X_1 = 1, X_2 = 2)$

   ii) $P(X_2 = 2 \mid X_0 = 1)$.

3. Attempt **any two** of the following : **(5 each)**

   a) If $(X, Y) \sim BN(3, 1, 16, 25, 0.6)$, calculate $P(-3 < X < 3 \mid Y = 4)$.

   b) If a r.v $X \sim LN(0, \mu, \sigma^2)$, find the distribution of X^α, where α is positive integer. If $X \sim LN(0, 1, 1)$, calculate $P(X^3 < 1)$.

   c) If $X \sim C(\mu, \lambda)$, obtain the distribution function of X and hence find the lower quartile.

4. Attempt **any one** of the following :

a) i) If X follows exponential distribution with mean $1/\lambda$, derive the p.d.f of truncated distribution truncated below K. Obtain the moment generating function of the above truncated variate. **5**

ii) Probability density function of a BN distribution is given by

$$f(x, y) = C \exp\left\{-\frac{2}{3}\left[\frac{(x-10)^2}{4} - \frac{(x-10)(y+15)}{6} + \frac{(y+15)^2}{9}\right]\right\}$$

$-\infty < x, y < \infty$

$C > 0.$

Identify the parameters and calculate the constant C. **5**

b) i) If X and Y are independent and identically distributed exponential random variates with mean $1/\lambda$, show that the distribution of the difference (X – Y) is Laplace. **5**

ii) A man has four pairs of socks which he changes every day choosing at random the three not worn on the previous day. The event E, is the wearing of the ith pair, i = 1, 2, 3, 4. Assuming that, the man has probability $1/2$ of forgetting to change his socks, obtain the transition probability matrix of this M.C. **5**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
STATISTICS (Principal)
ST – 342 : Testing of Hypotheses (Paper – II) (New)

Time : 2 Hours   Max. Marks : 40

Instructions : 1) **All** *questions are* **compulsory**.
                      2) *Figures to the* **right** *indicate* **full** *marks*.
                      3) **Use** *of statistical table and calculator is* **allowed**.
                      4) *Symbols and abbreviations have their* **usual** *meanings*.

1. a) Choose the correct alternative in **each** of the following cases :   **(1 each)**

    i) Size of a test of hypothesis is

       A) P [Type II error]

       B) P [Type I error]

       C) min {P(Type I error), P(Type II error)}

       D) max {P(Type I error), P(Type II error)}

    ii) If $X_1....X_n$ is a random sample from $N(\mu,\sigma^2)$ distribution, σ^2 known, B.C.R.
        for testing $H_0 : \mu = \mu_0 \ v/s \ H_1 : \mu = \mu_1 (> \mu_0)$ is of the type

       A) $\overline{X} \geq c$ 	B) $\overline{X} \leq c$

       C) $\sum\limits_{i=1}^{n} X_i^2 \geq c$ 	D) $\sum\limits_{i=1}^{n} (X_i - \mu)^2 \geq c$ where c is a constant.

    iii) Pivotal quantity used for the construction of confidence interval for σ^2 in
         case of $N(\mu,\sigma^2)$ distribution follows

       A) Binomial distribution 	B) Chi-square distribution

       C) F distribution 	D) t distribution

    iv) Which non-parametric test is used for testing goodness of fit to given data ?

       A) R sign test 	B) Kolmogorov-Smirnov test

       C) Chi-square test 	D) Mann-Whitney test

b) In **each** of the following cases state whether the given statement is **true** or **false** :

(1 each)

     i) In the construction of SPRT, both α and β are fixed in advance.

     ii) Power of a test is always greater than size of a test.

c) Define :

     i) Simple hypothesis,   ii) Critical region   **(1 each)**

d) i) State one advantage of SPRT over fixed sample size test.   **1**

     ii) If $X \rightarrow U(0, \theta)$ and a single observation for testing $H_0 : \theta = 2$ v/s $H_1 : \theta = 3$ is drawn, then find probability of type I error for the critical region $W = \{ x : x > 1.2 \}$.   **1**

2. Attempt **any two** of the following :   **(5 each)**

     a) Construct SPRT of strength (α, β) for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1 (> \theta_0)$ for exponential distribution with mean θ.

     b) Let $X_1, X_2 \ldots \ldots X_{15}$ be a random sample of size 15 from Poisson distribution with parameter m. Find uniformly most powerful critical region of size 0.02 for testing $H_0 : m = 0.4$ against $H_1 : m > 0.4$.

     c) Describe the procedure of Mann-Whitney test.

3. Attempt **any two** of the following :   **(5 each)**

     a) Determine the nature of the best critical region based on a random sample of size n for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1 (< \theta_0)$ if θ is the parameter in

$$f(x, \theta) = \begin{cases} (1 + \theta)x^\theta, & 0 < x < 1, \quad \theta > -1 \\ 0, & \text{otherwise} \end{cases}$$

     Also find the expression for the power of the test.

     b) Explain the procedure of finding a confidence interval for a given confidence coefficient for the difference between means of two normal populations when population variances are equal but unknown.

c) The data below give the monthly incomes (in Rs.) for a random sample of 12 families in a locality. 9,300, 15,000, 15,500, 7,000, 12,700, 10,000, 10,200, 9,600, 15,000, 11,800, 7,600, 21,000. Use a suitable non-parametric test for testing the null hypothesis that the median monthly income in the locality is Rs. 10,000 against the alternative hypothesis that it is greater than Rs. 10,000.

4. Attempt **any one** of the following :

a) i) Let $X_{(1)} < X_{(2)}.....< X_{(8)}$ be the order statistic for a random sample of size 8 from a continuous probability distribution with 70th percentile 27.3. Find
   i) $P[X_{(7)} < 27.3]$, ii) $P[X_{(5)} < 27.3 < X_{(8)}]$. **6**

   ii) A random sample of 20 observations is drawn from a normal population with mean $\mu = 5$ and variance σ^2. Find the best critical region of size α to test $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 = \sigma_1^2 (\sigma_1^2 > \sigma_0^2)$. **4**

b) i) Explain what is meant by a uniformly most powerful test by giving a suitable example. **5**

   ii) Below is given a random sample of size 6 from a certain population :
   0.05, 0.75, 0.43, 0.54, 0.19, 0.36. Test at 5% level of significance whether this sample can be assumed to be drawn from a uniform distribution over (0, 1). **5**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
STATISTICS (Principal)
ST – 343 : Statistical Process Control (Offline Methods) (Paper – III)

Time : 2 Hours   Max. Marks : 40

Instructions *: 1)* ***All*** *questions are* ***compulsory****.*
2) Figures to the ***right*** *indicate* ***full*** *marks.*
3) ***Use*** *of calculator and statistical tables is* ***allowed****.*
4) Symbols and abbreviations have their ***usual*** *meaning.*

1. a) In **each** of the following cases, choose the correct alternative :   **(1 each)**

   i) Structure function $S(\underline{X})$ of a series system is
   A) ΣX_i B) ΠX_i C) $1 - \Pi(1 - X_i)$ D) $1 - \Pi X_i$

   ii) AOQL is
   A) always same as incoming lot quality (p)
   B) always greater than incoming lot quality (p)
   C) max (AOQ)
   D) min (AOQ)

   iii) If T is a life time of a component, then reliability of a component at t is
   A) $P(T = t)$ B) $P(T < t)$ C) $P(T > t)$ D) $E[T / T > t]$

   iv) With a single sampling plan [500, 50, 1], probability of accepting a lot of quality 0.04 is
   A) 0.135335   B) 0.270671   C) 0.036631   D) 0.406006

   b) In **each** of the following, state whether the given statement is **true** or **false**.   **(1 each)**

   i) Reliability of a parallel system is always greater than or equal to the reliability of corresponding series system.

   ii) For a single sampling plan, ASN is an increasing function of lot quality.

   c) Define :

   i) AQL   **1**

   ii) Coherent system of components.   **1**

   d) i) Explain 'Point of control'.   **1**

   ii) State the expression for reliability of a parallel system with three components, each having reliability p.   **1**

2. Attempt **any two** of the following : **(5 each)**

a) Derive an expression for ATI under single sampling plan. Discuss the nature of ATI curve.

b) Obtain minimal cut sets and a structure function based on them for the system represented by following reliability block diagram :
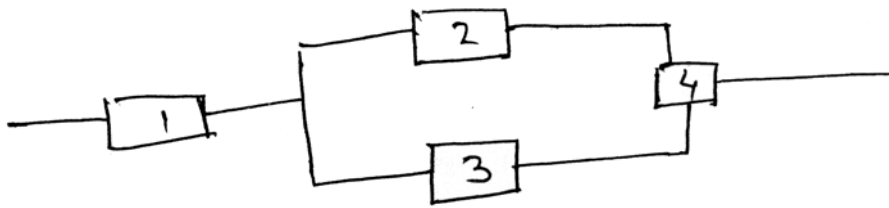
c) Discuss the role of statistical methods in ISO 9001 : 2000.

3. Attempt **any two** of the following : **(5 each)**

a) Define 'consumer's risk'. Explain its use in determination of a single sampling plan.

b) Define 2 out 3 system. Draw a fault-tree diagram for it. Also obtain reliability function for it if reliability of each component is p.

c) For Weibull distribution obtain expression of survival function and hazard function. Hence comment on nature of the distribution as IFR and DFR.

4. Attempt **any one** of the following :

a) i) Define 'hazard rate'. Show that a component with constant hazard rate, has exponential life time distribution.

   ii) Derive an expression for average sample number (ASN) of double sampling plan $[N, n_1, c_1, n_2, c_2]$. **(6+4)**

b) i) Explain the working of double sampling plan [1000, 20, 0, 10, 1]. Obtain probability of accepting a lot of quality 0.01.

   ii) Explain in brief : normal, reduced and tightened inspection. **(6+4)**

T.Y. B.Sc. (Sem. – IV) Examination, 2009
STATISTICS (Principal)
Paper IV : ST 344 : Design of Experiments

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* **All** *questions are* **compulsory**.
2) *Figures to the* **right** *indicate* **full** *marks.*
3) **Use** *of scientific calculator and statistical tables is* **allowed**.
4) *Symbols and abbreviations have their* **usual** *meaning.*

1. a) Choose the correct alternative in **each** of the following :   **(1 each)**

   i) In RBD with 4 treatments if degrees of freedom for error is 6, total degrees of freedom are

   A) 10   B) 11   C) 12   D) 35

   ii) Number of observations required to analyse LSD with 6 treatments is

   A) 216   B) 35   C) 36   D) 25

   iii) In replicate given below

   | a | b | bc | ac | | '1' | c | ab | abc |

   Block I   Block II

   confounded effect is

   A) BC   B) AB   C) AC   D) ABC

   iv) The total number of interaction effects in a 2^3 factorial experiment is

   A) 8   B) 5   C) 4   D) 3

   b) In **each** of the following cases, state whether the given statement is **true** or **false** :   **(1 each)**

   i) $L = 2\mu_1 - \mu_2 - \mu_3$ can be considered as a treatment contrast.

   ii) RBD is always more efficient than corresponding CRD.

P.T.O.

c) i) State the mathematical model used in LSD. **(1 each)**

ii) State estimators of the parameters involved in the model of LSD.

d) Define **each** of the following terms : **(1 each)**

i) treatment

ii) layout of an experiment.

2. Attempt **any two** of the following : **(5 each)**

a) State basic principles of design of experiment and explain any two of them.

b) Estimate the parameters involved in the mathematical model for RBD by least squares method. Give one real life situation where RBD can be used.

c) Explain split plot design. Give layout and ANOVA table for split-plot design.

3. Attempt **any two** of the following : **(5 each)**

a) Explain the term efficiency of a design. Given the following data, compute the efficiency of 5×5 LSD over corresponding CRD and comment on your result.

Row s.s. = 71.36   Treatment s.s. = 282.96

Column s.s. = 203.76   Total s.s. = 703.36

b) In a RBD with b blocks and t treatments, state the hypotheses to be tested. Also, explain the test procedure for testing these hypotheses.

c) Derive the expression for the main effect N in case of a 2^3 factorial experiment with factors N, P, K.

4. Attempt **any one** of the following :

a) i) State with assumptions the model used in ANOCOVA in CRD. Describe the procedure to test the hypothesis of regression coefficient (β) equal to zero. **5**

ii) Explain Yate's procedure to obtain factorial effect totals in a 2^3 factorial experiment. **5**

b) i) Show that for a CRD, mean sum of squares due to error is an unbiased estimator of error variance. **5**

ii) What are factorial experiments ? Explain the concept of confounding in factorial experiments. Distinguish between total and partial confounding. **5**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
STATISTICS (Paper – V) (Principal)
ST – 345 : Operations Research

Time: 2 Hours   Max. Marks: 40

Instructions *:* 1) ***All*** *questions are* ***compulsory***.
2) *Figures to the* ***right*** *indicate* ***full*** *marks.*
3) ***Use*** *of calculator and statistical tables is* ***allowed***.
4) *Symbols and abbreviations have their* ***usual*** *meanings.*

1. a) Choose the correct alternative in **each** of the following :   **(1 each)**

   i) In a transportation problem, the least cost method is used

      A) to find an initial feasible solution

      B) to find an optimum solution

      C) to find an alternate solution

      D) to find an initial basic feasible solution

   ii) Degeneracy in transportation problem (TP) with m sources and n destinations arises when

      A) $m \neq n$

      B) no. of occupied cells in solution are $> m + n - 1$

      C) no. of occupied cells in solution are $< m + n - 1$

      D) total supply $\neq$ total demand

   iii) Which of the following statements is true of an optimal solution to a L.P.P. ?

      A) The optimal solution uses up all resources

      B) Every LPP has an optimal solution

      C) If an optimal solution exists, there will always be at least one at a corner point

      D) The optimal solution always occurs at an extreme point

   iv) In the general definition of an assignment problem, xij is always.

      A) 0   B) 0 or 1

      C) 1   D) 1 or – 1

P.T.O.

b) In each of the following cases state whether the given statement is **true** or **false**.

(1 each)

i) The value of the objective function is same for primal and dual problem.

ii) Assignment technique is essentially a minimization technique.

c) Define **each** of the following : **(1 each)**

i) a slack variable.

ii) linear programming problem.

d) i) Explain the canonical form of a LPP.

ii) What is an idle time of a machine in a sequencing problem ? **(1 each)**

2. Attempt **any two** of the following :

a) Use graphical method to solve the following LPP.

Minimize $Z = 20x + 40y$

Subject to $6x + y \geq 18$

$x + 4y \geq 12$

$2x + y \geq 10 \qquad x, y \geq 0$ **5**

b) Obtain the dual of the following primal LPP :

Maximise $Z = 3x_1 + 6x_2$

Subject to $2x_1 - 3x_2 \leq 6$

$x_1 \geq 2$

$x_1 + 2x_2 = 4$

$x_1, x_2 \geq 0.$ **5**

c) i) Explain the north west corner method to obtain an IBFS of a balanced TP.

ii) What is an assignment problem ? Explain with one illustration. **(3+2)**

3. Attempt **any two** of the following : **(5 each)**

a) In simplex method how will you identify

   i) Unique optimal solution ?

   ii) Optimal solution of LPP for a maximisation problem ?

   iii) Unbounded solution ?

   iv) Degenerate solution ?

   v) Infeasible solution ?

b) Solve the following assignment problem for cost minimization :

Job

		1	2	3	4
	A	10	12	19	11
Persons	B	5	10	7	8
	C	12	14	13	11
	D	8	15	11	9

c) Find the sequence that minimizes total elapsed time (in hours) required to complete following jobs. Each job is to be processed on two machines A and B in order A B.

Jobs	1	2	3	4	5	6	7
Machine A	20	90	80	20	100	16	65
Machine B	25	60	75	30	90	35	50

Find minimum total elapsed time and idle time for two machines.

4. Attempt **any one** of the following : **(10 each)**

a) Solve the following LPP by simplex method.

Minimize $Z = x_1 + x_2 + 3x_3$

Subject to $\quad 3x_1 + 2x_2 + x_3 \leq 3$

$$2x_1 + x_2 + x_3 \geq 2$$

$$x_1, x_2 \geq 0$$

b) The following table shows the necessary information on the available supply to each warehouse, the requirement of each market and the unit transportation cost from each warehouse to each market.

Warehouse	Market I	II	III	IV	Supply
		Market			
A	5	2	4	3	22
B	4	8	1	6	15
C	4	6	7	5	8
Requirement	7	12	17	9	

Obtain an IBFS by VAM.

Obtain an optimal solution to above TP, by uv method.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
STATISTICS (Principal) (Paper – VI)
ST 346 (A) : C++ Programming

Time : 2 Hours Max. Marks : 40

Instructions: *1)* ***All*** *questions are* ***compulsory.***
2) Figures to the ***right*** *indicate* ***full*** *marks.*
3) ***Use*** *of calculator and statistical table is* ***allowed.***
4) Symbols and abbreviations have their ***usual*** *meanings.*

1. a) In **each** of the following cases, choose the correct alternative.
    i) A member of a class in C++ can be accessed by using operator.
       A) *   B) &   C) .   D) : :
    ii) Which of the following is not manipulator function ?
       A) end l   B) end s   C) setfill   D) friend
    iii) A variable whose value is address of another variable is called
       A) Structure   B) Pointer
       C) Object   D) Constructor
    iv) The mechanism of deriving a new class from an existing class is called.
       A) overloading   B) inheritance
       C) polymorphism   D) constructor   **(1 each)**

   b) In **each** of the following cases state whether the given statement is **true** or **false**.
    i) Function can not return class object.
    ii) Class members are public by default.   **(1 each)**

   c) i) What is a class in C++ ?
      ii) What is an object in C++ ?   **(1 each)**

   d) Define **each** of the following :
    i) this pointer
    ii) container class.   **(1 each)**

2. Attempt **any two** of the following :

   a) Write a C++ program to find mean and variance of n given observations.

   b) What is object oriented programming ? Describe in brief the characteristics of object oriented programming.

   c) Explain the concept of polymorphism. What are the rules of virtual function ?

   (5 each)

3. Attempt **any two** of the following :

   a) Write a C++ program to illustrate the use of constructor.

   b) Explain the following friend function, Inline member function.

   c) Write a C++ program to find minimum of n distinct numbers. **(5 each)**

4. Attempt **any one** of the following :

   a) i) What is inheritance ? What is single inheritance ? Explain the syntax rules in public, private and protected single inheritance. **5**

      ii) What is a constructor ? What are the rules governing the declaration of constructor ? **5**

   b) i) Write a C++ program to find factorial of positive integer. **5**

      ii) Explain the concept of function overloading. Write a C++ program to illustrate the use of function overloading. **5**

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STATISTICS (Principal) (Paper – VI)
ST 346 (B) : Statistical Ecology

Time : 2 Hours   Max. Marks : 40

Instructions: *i)* ***All*** *questions are* ***compulsory.***
ii) Figures to the ***right*** *indicate* ***full*** *marks.*
iii) ***Use*** *of calculator and statistical table is* ***allowed.***
iv) Symbols and abbreviations have their ***usual*** *meanings.*

1. a) In **each** of the following, choose the correct alternative.

   i) In logistic growth model, the carrying capacity is equal to

     A) k B) k^2 C) $\dfrac{k}{2}$ D) $2k$

   ii) Peterson's estimator of population size (N) for single recapture is

     A) $\dfrac{m_2 n_1}{n_2}$ B) $\dfrac{n_1 n_2}{m_2}$ C) $\dfrac{n_2 m_2}{n_1}$ D) $\dfrac{m_2}{n_1 n_2}$

   iii) For insect population if the weekly projection matrix M is given by

$$\begin{bmatrix} 0 & 5 & 8 \\ 0.4 & 0 & 0 \\ 0 & 0.3 & 0 \end{bmatrix}$$

   then the maximum life span of the insect species is

     A) 4 weeks   B) 5 weeks   C) 2 weeks   D) 3 weeks

   iv) In Gompertz model growth rate is maximum at

     A) $\dfrac{k}{2}$ B) $\dfrac{e}{k}$ C) $\dfrac{k}{2e}$ D) $\dfrac{k}{e}$ **(1 each)**

b) In **each** of the following, state whether the given statement is **true** or **false**.

   i) The regular forest is generally a result of competition between the species of nutrients in the soil.

   ii) Logistic growth model is not sigmoidal.   **(1 each)**

c) i) Define stable equilibrium.

    ii) Define aggregated forest. **(1 each)**

d) i) Explain in one or two lines what are rarefraction curves ?

    ii) State the situation where geometric distribution is applicable to model the species abundance. **(1 each)**

2. Attempt **any two** of the following :

a) Describe the line transact method for estimating animal population in a forest. What is the rationale behind using the exponential defection function ?

b) Given the following projection matrix

$$M = \begin{bmatrix} 2 & 5 \\ 0.6 & 0 \end{bmatrix}$$

Obtain stable population structure and comment on the growth of the population.

c) For a logistic growth model find the population size at which growth rate is maximum ? **(5 each)**

3. Attempt **any two** of the following :

a) Describe capture recapture method. Derive Peterson's estimator of population size (M) for single recapture in case of closed population.

b) Discuss the states of equilibrium in Gompertz model.

c) In Leslie matrix model, state the

    i) assumptions made

    ii) two kinds of parameters

    iii) matrix notation. **(5 each)**

4. Attempt **any one** of the following :

a) i) What is meant by point to individual nearest neighbour distance in Poisson forest ? Derive maximum likelihood estimator of parameter λ in it. Is this estimator unbiased ? If not, obtain an unbiased estimator of λ. **7**

    ii) Find Zippin's estimator of population size (N) if there are 2 removals with $n_1 = 50$ and $n_2 = 20$. Also estimate the probability of recapture (p). **3**

b) i) Describe the method of quadrat sampling to estimate the population density in a forest. Also discuss the scope and limitations of quadrat sampling method. **5**

    ii) Derive the expression for logistic growth model. **5**

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STATISTICS (Principal) (Paper – VI)
ST 346 (C) : Time Series Analysis

Time : 2 Hours   Max. Marks : 40

*N.B. : 1) **All** questions are **compulsory**.*
*2) Figures to the **right** indicate **full** marks.*
*3) **Use** of scientific calculator and statistical tables is **allowed**.*
*4) Symbols and abbreviations have their **usual** meaning.*

1. a) In **each** of the following cases, choose the correct alternative.   **(1 each)**

   i) If Y_t versus t (t-year) is the original time series observed for K years then series of link relatives is of the form

      A) $\dfrac{K}{Y_t}$ B) $\dfrac{Y_t}{Y_{t+1}}$

      C) $\dfrac{Y_{t+1}}{Y_t}$ D) $\dfrac{Y_t}{Y_1}$

   ii) If for a time series of 72 observations $Y_t = 34$ and $Y_{72} = 105$ then the average of the first differences is

      A) $\dfrac{139}{2}$ B) $\dfrac{71}{72}$ C) 1   D) $\dfrac{139}{71}$

   iii) For a time series with 50 observations the expected number of runs above and below the median will be

      A) $\dfrac{49}{2}$ B) 25

      C) 26   D) 24

   iv) If the monthly trend equation with July 2000 as origin is $Y_t = 8.30 + 0.018\,t$ then Y_t for December 2000 will be obtained by replacing t in the above equation by

      A) 12   B) 5

      C) 6   D) $\frac{1}{2}$

b) In **each** of the following cases, state whether the given statement is **true** or **false**. **(1 each)**

   i) While using method of moving averages of length k for updating forecast using no-trend model minimum number of observations required is k + 1.

   ii) For an AR(1) model, there is only one spike in PACF and values of ACF decay in geometric manner.

c) State with which component of a time series would you associate **each** of the following : **(1 each)**

   i) The rainfall that occurred in Calcutta for four days in February 1981.

   ii) Increase in garment sales in October.

d) i) Define 'Detrending of a time series'. **(1 each)**

   ii) State different methods of detrending a time series.

2. Attempt **any two** of the following : **(5 each)**

   a) i) State the autoregressive model of order 2.

   ii) Explain how sample autocorrelation coefficient of Lag 1 is computed.

   b) Explain the different criteria used to give single forecast for the parameter of no-trend model.

   c) Explain in brief the test for seasonality based on sample autocorrelation coefficient of Lag L.

3. Attempt **any two** of the following : **(5 each)**

   a) Explain the procedure to carry out simple exponential smoothing.

   b) i) State linear-trend model of a time series.

   ii) If (t, y_t), t = 1, 2....n is a time series, using method of selected points obtain the estimators of parameters of linear trend model.

   c) Suppose 60 observations are taken from a random series and the number of runs (R) above and below the median is determined. If R = 28, test the hypothesis that series is random at 10% l.o.s. State your conclusions.

4. Attempt **any one** of the following : (3+4+3)

a) i) Explain the meaning of deseasonalising data. What purpose does it serve ?

ii) Deseasonalize the following data on sales and interprete them.

Quarter	Sales('000)	S.I.
I	23.7	0.78
II	25.2	1.24
III	21.4	0.50
IV	65.4	1.48

iii) For a certain time series of 16 observations the autocorrelation coefficient of lag 4 (r_4) is found to be 0.70. Can we say at 5% l.o.s. that the seasonal effects are present in the series ? Justify.

b) i) Write a short note on 'differencing'. (4+6)

ii) Absenteeism of workers observed in a certain industry for 7 weeks is given below. Using moving average of length 4 obtain the forecast for week 8. If actual value for week 8 is 62 state the forecast error and the forecast for week 9.

Week	Absenteeism
1	32
2	40
3	26
4	37
5	48
6	66
7	73

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
GEOGRAPHY – I
Gg-341 : Resources and Environment

Time : 2 Hours   Max. Marks : 40

N.B. :   i) *All* questions are *compulsory*.
          ii) *Figures to the* ***right*** *indicate* ***full*** *marks.*
          iii) *Diagrams and maps must be drawn* ***wherever*** *necessary.*
          iv) *Use of map stencils is* ***allowed****.*

1. Answer the following questions in **one** or **two** sentences :   **10**
   a) Define ecosystem.
   b) Name two components of the human environment.
   c) Give two examples of fresh water ecosystems.
   d) Name two major causes of water pollution.
   e) What is the meaning of EIA ?
   f) Mention two major gases responsible for air pollution.
   g) State two effects of noise pollution on human health.
   h) What is green house effect ?
   i) Name two components of the natural environment.
   j) How is noise pollution measured ?

2. Write short answers **(any two)** :   **10**
   a) Methods of EIA.
   b) Effects of air pollution.
   c) Environmental hazards due to improving technology.

3. Write notes on **(any two)** :   **10**
   a) Man environment interrelationship with respect to size of population.
   b) Ozone depletion.
   c) Prevention of water pollution.

4. Discuss the nature and scope of environemntal studies.   **10**

                    OR

Give a detailed account of the equatorial and desert ecosystems.

_____

T.Y.B.Sc. (Sem. – IV) Examination, 2009
Gg-342 : GEOGRAPHY – II
Geography of Tourism

Time : 2 Hours　　　　　　　　　　　　　　　　　　　　Max. Marks : 40

N.B. : i) ***All*** questions are ***compulsory***.
　　　　 ii) Draw ***neat*** diagrams and sketches ***wherever*** necessary.
　　　　 iii) Use of map stencils is allowed.
　　　　 iv) Figures to the ***right*** indicate ***full*** marks.

1. Answer the following questions in **one** or **two** sentences :　　　**10**

   a) What is invisible export ?

   b) State any two impacts of tourism on language.

   c) Why land values are higher around tourist places ?

   d) State any two factors that impact tourists demand and supply.

   e) State the agency that looks after national level planning.

   f) Mention any two impacts of tourism on land and soil.

   g) What is a national park ?

   h) Give the meaning of the term 'Financial planning'.

   i) Mention any two tourist's attractions of Agra.

   j) In which states are Raigad and Bhakra located ?

2. Write short answers (**any two**) :　　　**10**

   a) Economic multiplier in tourism.

   b) Impact of tourism on wildlife.

   c) Environmental planning.

3. Write notes on (**any two**) :　　　**10**

   a) Tourism and basic infrastructure

   b) Different ways of promoting tourism

   c) Ganapati Pule.

4. With suitable examples discuss the nature of tourist planning.　　　**10**

　　　　　　OR

Describe tourists activities associated with Ajanta and Humpi as archeological sites.

————————

T.Y. B.Sc. (Semester – IV) Examination, 2009
GEOGRAPHY – III
Gg 343 : Fundamentals of Geographical Information Systems (GIS)

Time: 2 Hours   Max. Marks: 40

N.B. : 1) **All** questions are **compulsory**.

2) *The figures to the* **right** *indicate* **full** *marks.*

3) *Draw* **neat** *diagrams and sketches* **wherever** *necessary.*

4) *Use of map stencils is* **allowed**.

1. Answer the following questions in **one** or **two** sentences :   **10**

   a) Define gravity model.

   b) What is D.E.M. ?

   c) What is line drop ?

   d) What is spatial filtering ?

   e) Define the term data model.

   f) What is spatial analysis ?

   g) What are atmospheric corrections ?

   h) What do you mean by DN ?

   i) Define containment.

   j) What is a local operation ?

2. Write short answers (**any two**) :   **10**

   a) Explain geometric corrections.

   b) Explain the concept of unsupervised classification.

   c) State the basic operations used in image processing.

3. Write short notes (**any two**) : **10**

   a) Interpolation methods.

   b) Topographic analysis.

   c) Band ratio images.

4. What is overlay analysis ? Giving examples, explain the various overlay operations used in GIS. **10**

                    OR

   Using examples discuss the different types of queries used in GIS.

   ———————————————

T.Y. B.Sc. (Semester – IV) Examination, 2009
GEOGRAPHY – IV
Gg-344 : Geography of India

Time : 2 Hours   Max. Marks : 40

N.B. :   *1)* **All** *questions are* **compulsory***.*
   2) The figures to the **right** *indicate* **full** *marks.*
   3) Draw neat diagrams and sketches **wherever** *necessary.*
   4) Use of map stencils is allowed.

1. Answer the following questions in **one** or **two** sentences :   **10**

   a) State any two regions in India which produce natural gas.

   b) State two regions in India with highest potential of hydropower generation.

   c) Mention any two infrastructural factors in agriculture.

   d) What is blue revolution ?

   e) What is meant by agricultural intensity ?

   f) Mention any two factors influencing location of cotton textile industry in India.

   g) What is industrial regionalization ?

   h) State two regions of India with lowest population density.

   i) What is composition of population ?

   j) Mention any two air transport hubs in South India.

2. Write short answers (**any two**) :   **10**

   a) Discuss the energy crisis in India.

   b) Explain the significance of dry farming in India.

   c) Comment on the distributional aspect of iron and steel industry in India.

P.T.O.

3. Write notes (**any two**) :   **10**

   a) Bauxite distribution in India.

   b) Agricultural regionalization in India.

   c) Rural-urban migration in India.

4. What is green revolution ? Discuss the socio-economic and ecological importance of green revolution in India.   **10**

   OR

   Comment on the role played by the Indian railways in regional development of the country. Support your answer with suitable examples.

———————

T.Y. B.Sc. (Sem. – IV) Examination, 2009
GEOGRAPHY – V
Gg. - 345 : Geography of Soils

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
        2) *Figures to the* **right** *indicate* **full** *marks.*
        3) **Diagrams** *and maps must be drawn* **wherever** *necessary.*
        4) **Use** *of map stencils is* **allowed**.

1. Answer the following questions in **one** or **two** sentences.

   a) Define Pedology.

   b) What is leaching ?

   c) Mention major factors of soil formation.

   d) Mention the states in India affected by soil salinity.

   e) What do you mean by azonal soils ?

   f) Define lithosols.

   g) What do you understand by rill erosion ?

   h) What is soil degradation ?

   i) What do you understand by deforestation ?

   j) Mention various methods of soil management.   **10**

2. Write short answers (**any two**) :

   a) Explain how climate is a determinant factor in the process of soil formation.

   b) What do you understand by the term podzolization ?

   c) What do you understand by zonal soils ?   **10**

3. Write short notes (**any two**) :

   a) Laterization.

   b) Effects of overgrazing.

   c) Basis of Soil classification.   **10**

4. Explain the role of parent rocks, and relief in soil formation.

                 OR

   Write an essay on classification of tropical soils.   **10**

_____

T.Y. B.Sc. (Semester – IV) Examination, 2009
GEOGRAPHY – VI
Gg – 346 : Fundamentals of Remote Sensing

Time : 2 Hours
Max. Marks : 40

N.B : 1) *All questions are **compulsory**.*
2) *Figures to the **right** indicate **full** marks.*
3) *Diagrams and maps must be drawn **wherever** necessary.*
4) ***Use** of map stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences : **10**

   a) What are Polar orbit satellite ?

   b) What is MSS ?

   c) Define the term 'Spectral resolution'.

   d) State any two advantages of INSAT satellites.

   e) What is 'Platform' ?

   f) What is PSLV ?

   g) What do you mean by Band ?

   h) Give any two advantages of IRS satellite series of India.

   i) What is DIP ?

   j) What are the types of satellites ?

2. Write short answers (**any two**) : **10**

   a) Explain in detail the multispectral image and its uses.

   b) Write the advantages of aerial photographs over satellite images.

   c) State the major characteristics of LANDSAT satellite.

P.T.O.

3. Write short notes on **(any two)** : **10**

   a) Resolution

   b) Thermal infrared images

   c) SPOT.

4. Explain the importance of aerial photographs and satellite images in the natural resource studies. **10**

                    OR

   Describe with suitable examples various elements of visual interpretation of an aerial photographs and satellite images. **10**

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
MICROBIOLOGY
MB – 341 : Medical Microbiology (Paper – I)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.
       2) *All* questions carry *equal* marks.
       3) *Draw neat, labelled diagrams* **wherever** *necessary.*

1. A) Enlist **any two** for **each** of the following :   **5**

    1) Species of <u>Plasmodium</u>.

    2) Dermatophytes.

    3) Antiviral agents.

    4) Routes of drug administration.

    5) Drugs affecting bacterial cell wall synthesis.

   B) Match the following with correct answers :   **5**

I	II
1) Dengue	a) gp^{120}, gp^{41}
2) HIV	b) Cell membrane
3) Hepatitis A Virus	c) DNA gyrase
4) Polymixin	d) Platelet transfusion
5) Quinolones	e) Faeco-oral transmission

2. Attempt **any two** of the following :   **10**

   a) Enlist key signs, symptoms and explain transmission of Rinderpest disease.

   b) Explain antigenic variation in Influenza virus.

   c) Explain mode of action of griseofulvin and nystatin.

P.T.O.

3. Write short notes on **any two** of the following : **10**

   a) Aspergillosis.

   b) Mode of action of streptomycin.

   c) Drug degradation and drug modification as a mechanism of drug resistance.

4. Describe desirable parameters of a good chemotherapeutic agent. **10**

                OR

4. Explain pathogenesis of polio.

———————

T.Y. B.Sc. (Semester – IV) Examination, 2009
MICROBIOLOGY (Paper – II)
MB 342 : Genetics and Molecular Biology

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* **All** *questions are* **compulsory**.
2) *Draw neat labelled diagrams* **wherever** *necessary.*
3) *Figures to the* **right** *indicate* **full** *marks.*

1. Answer the sub questions as directed :   **10**

    A) Define the following terms :

       i) Operon

       ii) Plasmid incompatibility.

    B) State True or False :

       i) Rho factor is must for termination of DNA transcription.

       ii) ECO R I creates blunt ended DNA molecule.

    C) Select correct answer :

       – 10 sequence of promoter in <u>E.coli</u> DNA has _____ sequence.

       a) TATAAT   b) TAATTA

       c) TTAATT   d) TAAAAT

    D) Match the following :

A	**B**
a) Chimeric plasmid	1) PCR Technique
b) Tag polymerase	2) Parasexual cycle
c) Lysir inhibition	3) Prophage state
d) Mitotic crossing over	4) Plaque morphology
e) Lambda Lysogeny	5) pBR322

2. Answer **any two** of the following :　　　　　　　　　　　　　　**10**

   a) Describe Doerman's experiment to study the intracellular development of phages.

   b) Explain the concept of euploidy and aneuploidy with suitable examples.

   c) Give a protocol for curing of a plasmid DNA and state the mode of action of the curing agent on plasmid DNA.

3. Draw labelled diagrams of **any two** of the following :　　　　　　　**10**

   a) Use of double linkers in genetic engineering.

   b) Development of six different ascospore arrangements in <u>N. Crassa</u> at genetic level w.r.t mating type gene Ala.

   c) Southern blotting technique and hybridization technique.

4. Explain negative control and positive control of lactose operon in wild type <u>E.coli</u>.　　**10**

　　　　　　　OR

Explain establishment of Lambda lysogeny in <u>E.coli</u>.

————————————

T.Y. B.Sc. (Sem. – IV) Examination, 2009
MICROBIOLOGY (Paper – IV)
MB – 344 : Immunology

Time : 2 Hours   Max. Marks : 40

N.B. :   *1) **All** questions are **compulsory**.*
          *2) **All** questions carry **equal** marks.*
          *3) Draw neat **labelled** diagrams **wherever** necessary.*

1. a) Match with **correct** answer and **rewrite** :

   1) APC   – IgE

   2) Intracellular pathogen   – Autoimmune haemolytic Anaemia

   3) T_H Cells   – Cytosolic pathway

   4) Warm Agglutinins   – CD_4

   5) Anaphylaxis   – Class II MHC

   b) State **true** or **false** :

   1) A and B genes of ABO (H) system are codominant.

   2) Complete type of antibodies are responsible for HDN.

   3) CD_8 receptors of T_C cells recognize MHC class I molecules.

   4) Immune sera are used for active immunization.

   5) Failure of immune tolerance leads to autoimmunity.

2. Attempt **any two** :

   1) Compare primary and secondary immune response in tabular form.

   2) Diagrammatically represent structure of Class I and Class II HLA molecules.

   3) Justify - Antibodies can be used for immunosuppression.

P.T.O.

3. Write short notes (**any two**) :

   1) GVH

   2) Live attenuated vaccines

   3) Serum sickness.

4. Describe Cell mediated immune response in detail.

                   OR

   Enlist criteria for selection of blood donor. How is test for HIV carried out in blood bank ?

———————

T.Y. B.Sc. (Sem. – IV) Examination, 2009
MICROBIOLOGY
MB-345 : Fermentation Technology (Paper – V)

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* ***All*** *questions are* ***compulsory.***
           2) ***All*** *questions carry* ***equal*** *marks.*
           3) ***Draw*** *neat, labelled diagrams* ***wherever*** *necessary.*

1. A) i) _____ is used commercially as a sequestering agent.

    ii) Streptomycin is used in conjunction with _____

    iii) State true or false – Amylases are used for liquefaction of heavy starch paste.

    iv) State true or false – Lysine can be produced by direct fermentation.

    v) Give the role of rennet extract in cheese making.

   B) Match the following :

I	**II**
i) Tetanus	a) Lepidoptera
ii) Steroid	b) Cheese
iii) Riboflavin	c) Toxoid
iv) Thuricide	d) Cortisone
v) Camembert	e) Ashbya gossipi

2. Attempt **any two** of the following :

   a) Draw the structure and give flow sheet for recovery of lactic acid.

   b) Describe the semisynthetic penicillin with the help of two examples.

   c) Describe the time course of glutamic acid production.

3. Attempt **any two** of the following :

   a) Describe stepwise production of polio vaccine.

   b) Significance of Saccharomyces cerevisiae and Saccharomyces carlsbergensis in alcohol fermentation.

   c) Significance of precursors in Vit. B_{12} fermentation.

4. Describe the production of Baker's yeast and Brewer's yeast.

                    OR

   Describe production of protease and add a note on its applications.

_____

T.Y. B.Sc. (Sem. – IV) Examination, 2009
MICROBIOLOGY (Paper – VI)
MB-346 : Soil and Agricultural Microbiology

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.

2) *All* questions carry *equal* marks.

3) *Draw neat* labelled diagram *wherever* necessary.

1. Attempt the following :   **10**

   a) Define humus.

   b) Enlist two genera of Mycorrhiza.

   c) Name causative agent of rust.

   d) Write two names of plant diseases caused by bacteria.

   e) Write function of leghaemoglobin.

   f) _____ no. of ATPs are required for N_2 fixation process.

      i) 18   ii) 12   iii) 11   iv) 10

   g) Methanogens lack catalase enzyme - State True/False.

   h) Define Bioremediation.

   i) <u>Thiobacillus</u> <u>ferroxidans</u> is used in _____ leaching.

   j) Define mineralization.

2. Attempt **any two** of the following : 10

   a) Describe preparation of bioinoculants using non symbiotic nitrogen fixers.

   b) What are the components of biogas ? Draw neat labelled diagram of floating dome type digester.

   c) Describe hillside method of leaching.

3. Attempt **any two** of the following : 10

   a) Define Pesticides, enlist different factors that influence the fate of pesticides in soil.

   b) Diagrammatically explain carbon cycle.

   c) Discuss various methods of chemical control of plant diseases.

4. Attempt **any one** of the following : 10

   a) Describe powdery mildew with respect to

      i) Causative agent   ii) Plants affected.

      iii) Symptoms   iv) Control.

   b) Give structure of nitorgenase enzyme, add a note on biochemistry of symbiotic nitrogen fixation.

_____

T.Y. B.Sc. (Sem. – IV) Examination, 2009
ELECTRONICS SCIENCE
EL – 341 : Digital Circuits and Systems (Paper – I)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
2) Figures to the **right** indicate **full** marks.
3) Neat diagrams must be drawn **wherever** necessary.

1. Attempt **all** of the following :

   a) What is parity checker ?   **1**

   b) Why ECL family is also called as CML family ?   **1**

   c) List the applications of shift registers.   **1**

   d) Distinguish between PLA and PAL.   **1**

   e) Draw the logic diagram using XOR gates to convert Gray Code 1011 to binary
      number 1101.   **2**

   f) List various types of relational operators in VHDL.   **2**

   g) Draw the state diagram for D-flipflop.   **2**

   h) "CMOS family have static charge susceptibility". Comment.   **2**

2. Answer **any two** of the following :

   a) Explain the following characteristics of digital IC's.   **4**
      i) Fan in
      ii) Propagation delay
      iii) Speed-power product
      iv) Operating temperature.

   b) Write a short note on CPLD.   **4**

c) Draw the state diagram for the given state table. **4**

Present State	Next state, O/P	
	x = 0	x = 1
a	a, 0	b, 0
b	c, 0	d, 0
c	a, 0	d, 0
d	e, 0	d, 1
e	a, 0	d, 1

3. Answer **any two** of the following :

a) One bit comparator has two inputs A, B and three outputs A < B , A = B and A > B. Design the combinational logic circuit for it. **4**

b) What do you mean by ASIC ? State its advantages and disadvantages. **4**

c) Explain the following data types in VHDL : **4**

   i) BIT and BIT -VECTOR

   ii) STD – LOGIC and STD – LOGIC-VECTOR.

4. Answer the following :

a) Explain serial data transmission system with error detection using suitable block diagram. **6**

b) Draw the block diagram of Digital lock and explain it. **6**

OR

4. Answer the following :

a) Using D flipflops, design a synchronous counter to go through the states $0 \to 1 \to 3 \to 4 \to 6 \to 0$ **4**

b) A combinational logic is given by functions **4**

$Fl = AB + A\overline{C}$

$F2 = ABC + \overline{B}\ \overline{C}$

$F3 = \overline{A}\ \overline{B}\ C + A\overline{C}$

Implement the circuit with PAL.

c) Write the VHDL code (program) for 4 to 1 line multiplexer using structural modelling. **4**

T.Y. B.Sc. (Semester – IV) Examination, 2009
ELECTRONICS SCIENCE
(Paper – II) EL-342 : Process Automation

Time : 2 Hours   Max. Marks : 40

Note : i) **All** questions are **compulsory**.
          ii) Figures to the **right** indicate **full** marks.
          iii) Draw labelled diagrams **wherever** necessary.

1. Attempt **all** the following :

   a) In water heating system using steam flow, list controlled, controlling (manipulated) and load variable.   **1**

   b) What do you mean by direct action of controller ?   **1**

   c) State the major types of analog signal conditioning.   **1**

   d) Define neutral zone in process control.   **1**

   e) What is the output of 10 bit unipolar DAC with 10 V. reference voltage if input is $(0010100111)_2$?   **2**

   f) Draw the ladder diagram for
      Y = (A.OR.B).AND. C.   **2**

   g) State the purpose of actuator in final control.   **2**

   h) Derivative mode can not be used alone-comment.   **2**

2. Attempt **any two** of the following :

   a) Draw the block diagram of process control system and explain it. **4**

   b) Explain integral control mode. Write the expression for the output of controller. **4**

   c) With suitable block diagram, explain centralized computer control system. **4**

P.T.O.

3. Attempt **any two** of the following :

   a) Explain various characteristics of ADC. **4**

   b) Draw the circuit diagram for basic dc Wheatstone bridge. Obtain the expression
      for its offset voltage. **4**

   c) Draw the architecutre of PLC and explain it in brief. **4**

4. Attempt the following :

   a) What is composite control mode ? Draw the circuit diagram for PI controller
      using OPAMP and explain it. **6**

   b) Draw the block diagram of final control operation. Explain each block in detail. **6**

                    OR

4. Attempt the following :

   a) Find the controller output in PI mode; with $Kp = 5$, $KI = 1$ sec^{-1} and
      $PI(O) = 20\%$ for error, $ep = t\%$ in 0 to 1 sec. **4**

   b) A bridge circuit for potential measurement nulls when $R_1 = R_2 = 1K\Omega$,
      $R_3 = 605\,\Omega$ and $R_4 = 500\,\Omega$, with a 10 V supply voltage. Find unknown potential. **4**

   c) The input to the 10 bit ADC with 2.5 V reference is 1.54 V. What is the hex
      output ? **4**

_____

T.Y. B.Sc. (Semester–IV) Examination, 2009
ELECTRONIC SCIENCE (Paper – III)
EL 343 : Modeling and Simulation : Applications in Electronics

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
          2) Figures to the **right** indicate **full** marks.
          3) Neat **labelled** diagrams should be drawn **wherever** necessary.
          4) **Use** of nonprogrammable calculators and log tables is **allowed**.

1. Attempt **all** of the following :

   a) State the need for modeling of a system.   **1**

   b) State the advantages of Newton-Raphson method over false position method.   **1**

   c) Write the MATLAB code to obtain value of polynomial $F(X) = 6X^2 – 150$ at
      $X = 2$.   **1**

   d) State the MATLAB command to obtain derivative of polynomial.   **1**

   e) Describe in brief, the pivotal condensation technique used to solve simultaneous
      equations.   **2**

   f) Write various DC sweep statements used in PSPICE.   **2**

   g) State various independent voltage and current sources, that can be modeled by
      Pspice.   **2**

   h) "Numerical methods are generally implemented on computers". Comment.   **2**

2. Attempt **any two** of the following :

   a) Describe mathematical modeling of system with suitable example.   **4**

   b) Explain successive approximation method to obtain roots of an algebraic equation. **4**

   c) Compute the value of $I = \int\limits_{0}^{1} (X^2 + 1)\,dx$.

      by using trapezoidal rule with h = 0.1.   **4**

P.T.O.

3. Attempt **any two** of the following :

   a) State the importance of noise analysis using Pspice and give the statements used
      for performing noise analysis.   **4**

   b) Given $\dfrac{dY}{dX} = X + Y$, where Y (0) = 2. Compute the value of Y at X = 0.2,

      put h = 0.1. Use Runge-Kutta method.   **4**

   c) Write the MATLAB code to divide and multiply the polynomials :
      $f(X) = 3X^6 + 15X^5 - 10X^3 - 3X^2 + 15X - 40$ and
      $g(X) = 2X^2 + 3X - 10$.   **4**

4. Answer the following :

   a) State the need of modeling an element in Pspice and describe modeling of
      resistor in brief.   **6**

   b) What is an interpolation ? Obtain Lagrangian interpolation formula.   **6**

                           OR

4. Answer the following :

   a) The gain of a antenna is expressed as a function of angle, given by the equation

      $G(\theta) = \left|\dfrac{Sin\,4\theta}{4\theta}\right|$ for $-\pi/2 \leq \theta \leq \pi/2$ where θ is measured in radians. Write the

      MATLAB code to plot this gain function on a polar plot.   **4**

   b) Write a circuit file in Pspice to observe the waveform of half wave rectifier.   **4**

   c) The table below gives temperature (T) in °C and lengths l in mm of a heated rod.
      If $l = a_0 + a_1 T$, find the best values for a_0 and a_1.

T (in °C)	20	30	40	50	60	70
l (in mm)	800.3	800.4	800.6	800.7	800.9	801.0

                                                                                           4

T.Y.B.Sc. (Semester – IV) Examination, 2009
ELECTRONIC SCIENCE (Paper – IV)
EL - 344 : Physics of Electronic Materials

Time : 2 Hours   Max. Marks : 40

N.B. : *i)* **All** *questions are* **compulsory**.
ii) Numbers to the **right** *indicates* **full** *marks.*
iii) **Neat** *diagrams must be drawn* **wherever** *necessary.*
iv) **Use** *of nonprogrammable calculators and log table is* **allowed**.

Constants : Mass of electron = m = 9.1×10^{-31} kg
Boltzman constant k = 1.3807×10^{-23} Jk^{-1}
Charge on electron = e = 1.60218×10^{-19} coul
Planck constant = h = 6.625×10^{-34} J/S
Vel. of light = c = 3×10^8 m/s
Permittivity of vacuum/freespace = $\varepsilon_0 = 8.85 \times 10^{-12}$ c$v^{-1}$$m^{-1}$.

1. Answer **all** of the following :

   a) What is photoelectric effect ?   **1**

   b) State paulis exclusion principle.   **1**

   c) What is electrochemical potential ?   **1**

   d) Draw electronic structure of silicon.   **1**

   e) 'The capacitance effect is significant in reverse biased p-n junction' comment.   **2**

   f) What do you mean by extrinsic semiconductor ?   **2**

   g) 'Heterostructure LED is advantageous than simple LED' comment.   **2**

   h) What is the energy of blue photon which has a wavelength of 450 nm ?   **2**

2. Answer **any two** of the following :

   a) Write a note on Heisenberg's uncertainty principle. Give different form of
      uncertainty principle.   **4**

   b) Explain free electron model on the basis of quantum theory of solid.   **4**

   c) Describe effective mass of electron.   **4**

3. Answer **any two** of the following :

   a) Write a short note on 'de Broglie hypothesis.   **4**

   b) Explain formation of energy bands in sicrystal.   **4**

   c) Write a short note on 'Stimulated Emission'.   **4**

4. Answer the following :

   a) An electron has speed of 6000 m/s with accuracy of 0.05%. Calculate uncertainty with position of electron can be located.   **4**

   b) Calculate the de Broglie wavelength associated with an electron acclerated through 54 V and 100 V.   **4**

   c) Calculate diffusion coefficient of electron at 25°C having mobility of 1000 $cm^2v^{-1}s^{-1}$ in n type Si doped with 10^{12} As atoms per cm^3.   **4**

           OR

   a) Show that average KE of an electron in metal is $E_{av} = \frac{3}{5} E_{F0}$ where E_{F0} is Fermi energy at O°K.   **6**

   b) With the help of suitable diagram explain behaviour of an ideal p-n junction under 1) No Bias 2) Forward bias 3) Reverse Bias.   **6**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
ELECTRONIC SCIENCE (Paper – V)
EL–345 (A) : Power Electronics – II

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* ***All*** *questions are* ***compulsory***.
        2) Figures to the ***right*** *indicate* ***full*** *marks.*
        3) Draw labelled diagrams ***wherever*** *necessary.*
        4) Use of non-programmable calculator and log table is ***allowe****d.*

1. Attempt **all** of the following :

   a) State the advantages of current source Inverter.   **1**

   b) What is an AC regulator ?   **1**

   c) What are the advantages of DC motor drive ?   **1**

   d) What is the role of dc circuit breaker ?   **1**

   e) 'Quality of inverter is evaluated by its performance parameters' – Comment.   **2**

   f) What are the advantages of HVDC system ?   **2**

   g) The single phase bridge inverter has a resistive load $1.2\,\Omega$ and input dc voltage is 12 V. Determine the rms output voltage at the fundamental frequency V_1 and output power P_0.   **2**

   h) A DC motor controls a load at a speed of 1200 rpm. The field circuit resistance is $R_f = 110\,\Omega$, the field voltage is $V_f = 220$ V. Determine the back emf E_g.   **2**

2. Attempt **any two** of the following :

   a) What is the principle of series resonant inverters ? Explain series resonant inverter with unidirectional switches with circuit diagram. What are the advantages and applications of resonant inverters ? **4**

   b) Draw the circuit diagram of Buck regulator. Explain its working with necessary waveforms. State its limitations. **4**

   c) Draw the equivalent circuit of separately excited DC motor. Explain its function. What is its magnetization characteristic of DC motor ? **4**

3. Attempt **any two** of the following :

   a) Draw the circuit diagram of single phase current source inverter. Explain the action and state the expression of output current. **4**

   b) Explain the working of single phase transformer tap changer with circuit diagram. State three modes of operations. **4**

   c) What is the role of crowbar circuit ? Explain its function with circuit diagram. **4**

4. Attempt **any two** of the following :

   a) Explain the principle of phase control in AC voltage controller. Draw the circuit diagram of single phase unidirectional and bidirectional controller with resistive load. Explain its working. **6**

   b) Explain the working of induction motor with its circuit model. Define the term synchronous speed and slip. List any four performance parameters. **6**

   c) Write note on :
      i) Controlled electric heating.
      ii) Air conditioning. **6**

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ELECTRONIC SCIENCE (Paper – V)
EL – 345 (B) : Principles and Applications of Sensors – II

Time : 2 Hours   Max. Marks : 40

> *N.B.* : *1)* ***All*** *questions are* ***compulsory***.
> *2) Figures to the* ***right*** *indicate* ***full*** *marks.*
> *3)* ***Neat*** *labelled diagrams should be drawn* ***wherever*** *necessary.*
> *4) Use of non-programmable calculators and log tables is* ***allowed***.

1. Attempt **all** of the following :

   a) State applications of potentiometric transduer.   **1**

   b) What is MEMS ?   **1**

   c) State different sensors used in aerospace.   **1**

   d) Define gauge factor of strain gauge sensor.   **1**

   e) Digital displacement sensor is also known as encoder : comment.   **2**

   f) Materials of wire and jockey in potentiometric transducer are equally important : Comment.   **2**

   g) What is excitation ? Why it is required ?   **2**

   h) PEVCD is advantageous than CVD technique : Comment.   **2**

2. Attempt **any two** of the following :

   a) What are the different types of magnetostrictive transducers ? Explain any one in brief.   **4**

   b) Sketch and explain variable parallel plate capacitive transducer.   **4**

   c) Explain the principle and working of digital displacement transducer with neat diagram.   **4**

3. Attempt **any two** of the following :

   a) What do you mean by smart sensor ? What are the essential elements in such unit ? With neat diagram explain the arrangement of smart sensor. **4**

   b) Describe diffusion and Ion-implantation methods for the preparation of thin films. **4**

   c) Explain with the help of neat diagram how an environmental hazards spreads. **4**

4. Attempt **any two** of the following :

   a) What is proximity sensor ? Describe the working principle of inductive proximity sensor with suitable diagram. **6**

   b) State different medical diagnostic sensors and explain electromagnetic sensor used in this field. **6**

   c) Write a note on respiration sensor. **6**

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ELECTRONIC SCIENCE (Paper – V)
EL – 345 (C) : Industrial Electronics – II

Time : 2 Hours   Max. Marks : 40

N.B. : *1)* ***All*** *questions are* ***compulsory.***
        2) Figures to the ***right*** *indicate* ***full*** *marks.*
        3) Draw ***neat*** *labelled diagram* ***wherever*** *necessary.*

1. Attempt **all** of the following :

    a) List different types of amplifiers used in industrial application.   **1**

    b) What are advantages of PWM type inverter ?   **1**

    c) What do you mean by NOTC timer ?   **1**

    d) What is the basic objective of process control system ?   **1**

    e) State advantages of IC timer circuits.   **2**

    f) State working principle of electro mechanical timer.   **2**

    g) "Multiplexer is an important building block of DAS". Comment.   **2**

    h) State advantages of PLC.   **2**

2. Attempt **any two** of the following :

    a) Distinguish between simple inverter and power inverter.   **4**

    b) Explain the working of integrated circuit timer with neat diagram.   **4**

    c) Discuss the working of CNC machine.   **4**

3. Attempt **any two** of the following :

   a) What do you mean by over voltage protection ? Explain over voltage protection circuit using thyrister. **4**

   b) Draw architecture of PLC and explain it in brief. **4**

   c) With neat diagram explain the working of resistance welding control. **4**

4. Attempt **any two** of the following :

   a) Explain with circuit diagram the working of difference amplifier. What are its application areas ? **6**

   b) With neat block diagram explain the working of Data Acquisition system (DAS). **6**

   c) State various instrument assembly technique. Explain any two in brief. **6**

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ELECTRONIC SCIENCE (Paper – V)
EL – 345 (D) : Entrepreneurship Development

Time : 2 Hours Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
2) *Figures to the* **right** *indicate* **full** *marks.*
3) *Draw* **neat** *labelled diagrams* **wherever** *necessary.*

1. Attempt **all** of the following :

   a) What is a service industry ? **1**

   b) State any two qualities possed by an enterpreneur. **1**

   c) Explain the term 'fund flow'. **1**

   d) Define 'SSI'. **1**

   e) State objective of marketing management. **2**

   f) State characteristics of 'Joint Stock Company'. **2**

   g) List characteristics of service industry. **2**

   h) State the factors that motivates employee to work. **2**

2. Attempt **any two** of the following :

   a) Explain in brief how a project report can be evaluated. **4**

   b) State the steps involved in marketing research. **4**

   c) Describe different motives possed by an entrepreneur in detail. **4**

3. Attempt **any two** of the following :

   a) How a public limited company is different that of private limited company ? **4**

   b) What is Co-operative society ? State its features. **4**

   c) Write short note on "Joint Stock Company". **4**

4. Attempt **any two** of the following :

   a) Explain the role of commercial banks in financing SSI unit. **6**

   b) Explain how interpersonal relation and communication skills are effective in smooth conduct of a business unit. **6**

   c) Describe strength-weakness-opportunities-threats analysis. What its importance to an enterpreneur ? **6**

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T.Y. B.Sc. (Sem. –IV) Examination, 2009
ELECTRONIC SCIENCE (Paper – VI)
EL 346 (A) : Computer Networking

Time : 2 Hours   Max. Marks : 40

N.B.: i) **All** questions are **compulsory**.

ii) *Figures to the **right** indicate **full** marks.*

iii) *Draw labelled diagrams **wherever** necessary.*

1. Attempt **all** the following :

    a) What is network topology ?   **1**

    b) List different transmission media.   **1**

    c) State different types of connectors used in network.   **1**

    d) What are steps used in cableing ?   **1**

    e) What are LAN, WAN and MAN ?   **2**

    f) State different types of topologies.   **2**

    g) What is goal of SNMP Protocol ?   **2**

    h) What are benefits of file server network ?   **2**

2. Attempt **any two** of following :

    a) Explain TCP/IP protocols used in internet.   **4**

    b) With neat diagram explain client-server network.   **4**

    c) Explain how network accounts are managed ?   **4**

3. Attempt **any two** of following :

   a) What are the different types of network connectivity devices ? Explain any one of them. **4**

   b) What are various network management tools ? Explain any one of them. **4**

   c) Explain various problems associated with cables in the network. **4**

4. Attempt **any two** of the following :

   a) What is OSI model ? Explain in detail. **6**

   b) Explain the steps in designing the network for given organization. **6**

   c) Explain ethernet card in detail. What are the different cards used in types of ethernet used in networking ? **6**

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ELECTRONIC SCIENCE (Paper – VI)
EL 346 (B) : NETWORK OPERATING SYSTEM

Time : 2 Hours   Max. Marks : 40

N.B.: 1) *All questions are compulsory.*

2) *Figures to the right indicate full marks.*

3) *Draw diagram wherever necessary.*

1. Attempt **all** of the following :

   a) State the role of DNS in network.   **1**

   b) What do you mean by network connectivity ?   **1**

   c) State function of ZEN works.   **1**

   d) What is DHCP ?   **1**

   e) What are security policies in networking ?   **2**

   f) Compare user and group managements.   **2**

   g) "Any operating system can be used as Network Operating System". Comment. **2**

   h) List the hardware monitoring tools of LINUX.   **2**

2. Attempt **any two** of the following :

   a) How will you set up a mail server using LINUX ?   **4**

   b) What are various utilities of ZEN in Novell netware ?   **4**

   c) Explain the resource management of windows NOS.   **4**

3. Attempt **any two** of the following :

   a) Write a short note on Novell directories services.   **4**

   b) Describe the features of LINUX network operating system.   **4**

   c) Explain steps involved in configuring the network devices.   **4**

4. Attempt **any two** of the following :

   a) Write a note on Novell netware security.   **6**

   b) Explain administration utility of LINUX.   **6**

   c) Explain file system of windows NT.   **6**

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ELECTRONIC SCIENCE (Paper – VI)
EL 346 (C) : BIOMEDICAL INSTRUMENTATION – II

Time : 2 Hours   Max. Marks : 40

N.B.: i) **Neat** diagrams must be drawn **wherever** necessary.
ii) Black figures to the **right** indicate **full** marks.
iii) Use of Logarithmic Tables, Slide rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.
iv) **All** questions are **compulsory**.

1. Solve the following :

   a) What is respiration ?   **1**

   b) Define sensor.   **1**

   c) What do you mean by ophthalmology ?   **1**

   d) State at least two types of pacemakers.   **1**

   e) What is acid-base balance ?   **2**

   f) Electrodes are good sensors used in biomedical field. Comment.   **2**

   g) What do you mean by acoustic impedance ?   **2**

   h) What is microshocks ?   **2**

2. Answer **any two** :

   a) Draw a diagram for pH-electrode. Explain how it is used for measurement of pH ?   **4**

   b) Write a short note on magnetic resonance.   **4**

   c) What are different modes of ventilators ? Explain their different types. **4**

3. Answer **any two** :

   a) Explain any audiometer with suitable diagram. **4**

   b) Write a short note on electrical safety analysis. **4**

   c) List various susceptibility parameters and explain them in brief. **4**

4. Answer **any two** :

   a) Draw the block diagram of water sealed spirometer and explain its working. **6**

   b) Write a note on Electrophoresis. **6**

   c) Explain with suitable diagram position emission computed tomography. **6**

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ELECTRONIC SCIENCE
EL 346 (D) : MEDICAL INSTRUMENTATION – II
(Paper – VI)

Time : 2 Hours   Max. Marks : 40

N.B.: 1) **All** questions are **compulsory**.

2) *Figures to the* **right** *indicate* **full** *marks.*

3) *Draw labelled diagrams* **wherever** *necessary.*

4) *Use of calculator and log table is* **allowed**.

1. Attempt **all** of the following :

   a) What is biopotential ?   **1**

   b) What is ERG ?   **1**

   c) Which cells are known as Excitable Cells ?   **1**

   d) State the sources of noise in measurement using medical instruments. **1**

   e) State at least four body surface recording electrodes.   **2**

   f) Name any two chemical tests in medical field.   **2**

   g) What is the use of electrical safety analyser ?   **2**

   h) What is the flame photometer ?   **2**

2. Attempt **any two** of the following :

   a) Explain with diagram the Electro-cardiogram.   **4**

   b) Describe absorption filters and interference filters.   **4**

   c) Explain Electrode-skin interface.   **4**

3. Attempt **any two** of the following :

   a) Write a note on micro-electrodes. **4**

   b) Explain in brief, how medical diagnosis can be performed with the help of chemical tests ? **4**

   c) State the function of radiation source. Explain in brief Tungstan-Halogen light source. **4**

4. Attempt **any two** of the following :

   a) What are electrode arrays ? Draw schematic diagrams of three types of arrays and explain in brief. **6**

   b) What are the steps to be considered for electrical safety while designing the medical equipments ? Explain. **6**

   c) State the general considerations for signal conditioning circuit. Explain it in brief. **6**

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ELECTRONIC SCIENCE (Paper – VI)
EL 346 (E) : AGRICULTURAL ELECTRONICS – II

Time : 2 Hours   Max. Marks : 40

N.B.: *1)* ***All*** *questions are* ***compulsory****.*

   2) Figures to ***right*** *indicate* ***full*** *marks.*

   3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

1. Attempt **all** of the following :

   a) State the advantage of freeze drying at ultra low temperature.   **1**

   b) What is the role of data logger in agriculture ?   **1**

   c) "It is essential that the moisture content of food grains be known before they are accepted for storage". Comment.   **1**

   d) Define precision farming.   **1**

   e) Suggest a sensor that can be used to develop automatic sorting of food grains. Give one example.   **2**

   f) List leaf parameters. Why study of them is important in agriculture ?   **2**

   g) Why standard procedures are followed for troubleshooting and maintenance ? Give example.   **2**

   h) What are electrical moisture measuring meters ? How the accuracy of moisture measurement is increased ?   **2**

2. Attempt **any two** of the following :

   a) Discuss aeration for monitoring grain quality in a post harvest storage process.   **4**

   b) Draw block diagram for single channel data acquisition system. Explain its working in brief.   **4**

   c) Write a short note on field usable pH meter.   **4**

3. Attempt **any two** of the following :

   a) What is AWS ? With the help of block diagram explain its working. **4**

   b) List the procedure to be followed for maintenance of digital weighing machine. **4**

   c) Write short note on warehouse for food grain storage. **4**

4. Attempt **any two** of the following :

   a) What is an irrigation system ? How it can be automated ? List the advantages of autoirrigation system. **6**

   b) Write short note on remote sensing and its application in agriculture. **6**

   c) Draw and explain bath tub graph for an instrument. Explain its advantages in maintenance. **6**

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ELECTRONIC SCIENCE
EL 346 (F) : FIBER OPTICS AND FIBER OPTIC COMMUNICATION – II
(Paper – VI)

Time : 2 Hours   Max. Marks : 40

N.B.: 1) **All** questions are **compulsory**.
2) *Figures to* **right** *indicate* **full** *marks*.
3) *Draw labelled diagram* **wherever** *necessary*.

1. Attempt **all** of the following :

   a) State an advantage of axial vapour deposition technique.   **1**

   b) What do you mean by attenuation in optical fiber ?   **1**

   c) State principle on which optical fiber current sensor works.   **1**

   d) State application of optical amplifier.   **1**

   e) State need of packing of optical fiber.   **2**

   f) Compare the speed of response of LED and LASER.   **2**

   g) State the merits of optical fiber sensor over conventional sensors.   **2**

   h) What do you mean by intensity modulated sensor ?   **2**

2. Attempt **any two** of the following :

   a) With schematic diagram explain external chemical vapour deposition method.   **4**

   b) With suitable diagram explain measurement of dispersion in optical fiber.   **4**

   c) Write a note on semiconductor laser amplifier.   **4**

3. Attempt **any two** of following :

   a) Explain LED driver circuit used in optical fiber transmitter. **4**

   b) With energy level diagram explain the working of Erbium doped Silica fiber laser. **4**

   c) Explain in brief optical fiber liquid level sensor. **4**

4. Attempt **any two** of following :

   a) Discuss what do you mean by fusion splicing of optical fiber ? Discuss advantages and drawbacks. **6**

   b) Discuss various aspects while designing optical fiber communication system. **6**

   c) With neat diagram explain shadow method of fiber outer diameter measurement. **6**

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T.Y.B.Sc. (IV Semester) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – I)
DS-341 : Role of Science and Technology in National Security

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
        2) *Figures to the* **right** *indicate* **full** *marks.*

1. Answer in **two** to **four** sentences **each** :   **16**
   1) Define Resource Base.
   2) State the meaning of Naval Science.
   3) What do you mean by Material science ?
   4) Define Applied science.
   5) What is meant by Integrated Guided Missile Development Programme (IGMDP) ?
   6) Define Electronic Warfare.
   7) What is Artificial Intelligence ?
   8) What is mean by Strategic Reconnaissance ?

2. Answer in **eight** to **ten** sentences (**any two**) :   **8**
   1) Explain theory of Relativity.
   2) Discuss New trends in computers.
   3) Explain role of Communication in Defence.
   4) Discuss India's Space Programme.

3. Write short notes on (**any two**) :   **8**
   1) Electronic Warfare
   2) Simulation and Wargaming
   3) Information Superiority (IS)
   4) Operational Research.

4. Answer in **16** to **20** sentences (**any one**) :   **8**

   1) Write an essay on relevance of Science and Technology in National Security.

   2) Explain contribution of DRDO in India's defence production.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – III)
DS 343 : Defence Economics

Time : 2 Hours   Max. Marks : 40

N.B : *i) **All** the questions are **compulsory**.*
*ii) Figures to the **right** indicate marks.*

1. Answer in **2** to **4** sentences **each** :   **16**

   1) Explain the meaning of political economy of Defence expenditure.

   2) Explain the concept of Economic Development.

   3) State any two importance of R & D in defence production.

   4) What is meant by war time Economy ?

   5) Define 'Economic Blockade'.

   6) Explain the meaning of Economic Mobilisation.

   7) What do you mean by 'Threat Perception' ?

   8) Explain the meaning of the 'Economic Resources of war'.

2. Answer in **8** to **10** sentences (**any two**) :   **8**

   1) Explain economic elements of 'War potential'.

   2) Explain methods of calculating the real cost of war.

   3) Explain pre-war economic problems.

   4) Explain 'Borrowing' a way finance.

3. Write short notes on **(any two)** :   8

   1) Determinants of Defence expenditure.

   2) Methods of war finance.

   3) Effects of war on 'industrial organisation'.

   4) Importance of price control during war.

4. Answer in **16** to **20** sentences (**any one**) :   8

   1) Discuss the relationship between Defence and Development.

   2) Critically analyse India's Defence expenditure since 1980's.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – IV)
DS – 344 : Indian Military History

Time: 2 Hours　　　　　　　　　　　　　　　　　　　　Total Marks: 40

Instructions : 1) **All** questions are **compulsory**.
　　　　　　　　2) *Figures to the* **right** *indicate* **full** *marks.*

1. Answer in **2** or **4** sentences **each** :　　　　　　　　　　**16**
   1) State the duration of Rajput period.
   2) What was the chief weapon of Rajputs ?
   3) When and between whom the battle of Somnath was fought ?
   4) What was the aim of Mughals for battle of Haldighat ?
   5) Which weapon it was introduced by Babar to the Indians ?
   6) State any two names of Southern Indian Empires.
   7) When and between whom the first battle of Panipat was fought ?
   8) State the duration of Sultanate period.

2. Answer in **8** to **10** sentences (**any two**) :　　　　　　　　**8**
   1) Write in short "Rajputs Art of war".
   2) What was the impact of battle of Haldighat ?
   3) Explain in brief the significance of first battle of Panipat.
   4) Write in brief the demerits of Mansabdar system.

3. Write short notes on (**any two**) :　　　　　　　　　　　　**8**
   1) Concept of Mansabdar.
   2) Impact of Battle of Somnath.
   3) Turkish Military System.
   4) Merits of Rajputs.

4. Answer in **16** to **20** sentences (**any one**) :　　　　　　　**8**
   1) Analyse the causes of decline of Rajputs power.
   2) "First battle of Panipat was decisive battle in military history of India". Do you agree? Justify your answer.

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – V)
DS – 345 : Computer Application in Defence

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
       2) Figures to the **right** indicate marks.

1. Answer in **2** to **4** sentences **each** :   **16**

   1) Define internet.

   2) What are the components of mail message ?

   3) Define web browser.

   4) What do you mean by E-mail client ?

   5) State the meaning of war gaming.

   6) What is High-tech war ?

   7) Define Target acquisition system.

   8) What is Star war ?

2. Answer in **8** to **10** sentences (**any two**) :   **8**

   1) Role of accurate information in decision making. Explain.

   2) Explain R and D simulator.

   3) Discuss application of computer in Surveillance.

   4) Explain application of computer in Night-vision.

3. Write short notes (**any two**) :   **8**

   1) Application of computer in Weapon system.

   2) Application of computer in Hightech war.

   3) Application of computer in S.D.I.

   4) Application of computer Battlefield command and control.

4. Answer in **16** to **18** sentences (**any one**) :   **8**

   1) Write a note on the role of computer in defence management.

   2) Explain historical evolution and characteristics of computers.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – VI)
DS-346 (A) : Strategic Thinkers

Time : 2 Hours
Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.
2) *Figures to the* ***right*** *indicate* ***full*** *marks.*

1. Answer in **2** to **4** sentences **each** : **16**

   a) What do you mean by Air Power ?

   b) Who are Guerilla fighters ?

   c) Name the country to which Trotsky belonged.

   d) When did Second World War end ?

   e) When was treaty of Versaillies signed ?

   f) State the concept of power.

   g) What do you understand by Tank ?

   h) A.T. Mahan belonged to which country ?

2. Answer in **8** to **10** sentences (**any two**) : **8**

   a) Write in brief on Douhet's Theory of Air Power.

   b) Explain Mao's concept of Guerilla warfare.

   c) Explain the soviet concept of war by Lenin.

3. Write short notes on (**any two**) : **8**

   a) Liddle Hart's concept of 'Indirect Approach'.

   b) Concept of Tank warfare.

   c) A.T. Mahan's views on sea power.

4. Answer in **16** to **20** sentences (**any one**) : **8**

   a) Discuss the Soviet concept of war as practised by Stalin.

   b) Explain Fuller's contribution to mobile warfare.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – VI)
DS-346 (B) : International Law

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
2) *Figures to the **right** indicate **full** marks.*

1. Answer in **2** or **4** sentences **each** :   **16**
   a) What do you understand by Belligerent ?
   b) Define 'Veto' Power.
   c) What is Blockade ?
   d) What are War Tribunals ?
   e) How many members are there in UN Security Council ?
   f) What do you understand by crimes against peace ?
   g) What does ICC stands for ?
   h) Write full form of NATO.

2. Answer in **8** or **10** sentences (**any two**) :   **8**
   a) Write in brief on Geneva conventions.
   b) State the relation between Belligerent and neutrals.
   c) State the role of International Court of Justice in prohibiting war.

3. Write short notes on (**any two**) :   **8**
   a) UN peace keeping force.
   b) Crimes against Humanity.
   c) Neutrality.

4. Answer in **16** to **20** sentences (**any one**) :   **8**
   a) Highlight on various war tribunals established to give justice have failed. Justify.
   b) Examine the role of General Assembly of UN in maintaining International Peace and Security.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – VI)
DS-346 (C) : Refugee Studies

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.
2) *Figures to the* **right** *indicate* **full** *marks*.

1. Answer in **2** to **4** sentences **each** :   **16**
   1) What do you mean by International Protection ?
   2) State any 2 rights of refugee.
   3) What is voluntary repartriation ?
   4) Who is heading the Tibetean refugee problem ?
   5) Which country has annexed Tibet ?
   6) Tamil refugees are from which country ?
   7) What does UNHCR stands for ?
   8) What does LTTE stand for ?

2. Answer in **8** or **10** sentences each (**any two**) :   **8**
   1) Write the functions of UNHCR.
   2) Why does India not have refugee law ?
   3) How are refugees protected by International law ?

3. Write short notes on (**any two**) :   **8**
   1) Duties of refugee.
   2) Migrants
   3) NGOs.

4. Answer in **16** to **20** sentences (**any one**) :   **8**
   1) Describe the status of refugees in India.
   2) Are there regional protection systems for refugees ?

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T.Y. B.Sc. (Semester–IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper–VII)
DS 347 (A) : Maratha Art of War and Military System

Time : 2 Hours   Max. Marks : 40

***Instructions** : 1) **All** questions are **compulsory**.*
*2) Figures to the **right** indicate **full** marks.*

1. Answer in **2** or **4** sentences **each** :   **16**
   1) Which tactics it was introduced by Shivaji ?
   2) Write any two demerits of Sambhaji.
   3) What do you know about Tarabai ?
   4) Why the Mughals gave the Sanad to Maratha ?
   5) What was the aim of Marathas for battle of Palkhed ?
   6) State any two demerits of Maratha.
   7) What do you know about Sadashiv Rao Bhau ?
   8) What do you mean by Peshwa ?

2. Answer in **8** or **10** sentences (**any two**) :   **8**
   1) Why the Sahu was released by the Mughals ?
   2) Write few lines on Rajaram.
   3) Explain the result of battle of Bhopal.
   4) Write in short about 'Najibkhan'.

3. Write short notes on (**any two**) :   **8**
   1) Santaji
   2) Khanhoji Angre
   3) Impact of third battle of Panipat.
   4) First Anglo Maratha War.

4. Answer in **16** or **20** sentences (**any one**) :   **8**
   1) Analyse the causes of defeat of Maratha at "Third Battle of Panipat".
   2) Highlight on Military leadership of Sambhaji.

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T.Y. B.Sc. (Semester–IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper–VII)
DS 347 (B) : International Organisation

Time : 2 Hours   Max. Marks : 40

N.B. :   1) *All* questions are *compulsory*.
        2) *Figures to the **right** indicate **full** marks.*

1. Answer in **2** to **4** sentences **each** :   **16**
   a) What does UNESCO stands for ?
   b) Who is the present Secretary General of UN ?
   c) What do you understand by Human Rights ?
   d) What does OAU stands for ?
   e) What is self-determination ?
   f) Write full form of UNICEF.
   g) What is POW ?
   h) Write full form of WTO.

2. Answer in **8** to **10** sentences **(any two)** :   **8**
   a) Write the problems in working of UN.
   b) Why Human Rights are necessary ?
   c) Explain the nature of Economic and Social Council.

3. Write short notes on (**any two**) :   **8**
   a) Indigenous people
   b) ICCPR
   c) IMF.

4. Answer in **16** to **20** sentences (**any one**) :   **8**
   a) How far UN is successful in making States obey Human Rights ?
   b) Explain the difficulties in reforming UN.

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T.Y. B.Sc. (Semester–IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper–VII)
DS 347 (C) : Evaluations of Western Art of War

Time : 2 Hours   Max. Marks : 40

Instructions : *1) **All** questions are **compulsory**.*
                 *2) Figures to the **right** indicate **full** marks.*

1. Answer in **2** or **4** sentences **each** :   **16**
   1) State the names of Allied Countries during World War–II.
   2) What do you mean by ''Virtual Stalemate'' ?
   3) State any two famous battle of Tanks during World War–I.
   4) Where the ''Trench Warfare'' was fought ?
   5) How Germans got rid off from Naval Blockade during World War–I ?
   6) Which country had introduced the Tank ?
   7) What do you understand by Schliffen plan ?
   8) Which treaty it was signed at the end of First World War ?

2. Answer in **8** to **10** sentences **(any two)** :   **8**
   1) Write in brief ''North African Campaign''.
   2) Explain the end of World War Second.
   3) Explain in brief rise of Japan as a military power during inter-war period.
   4) Write in brief Blitzkreig Tactics of Germany.

3. Write short notes on (**any two**) :   **8**
   1) Japanese attack on Pearl Harbor during World War Second.
   2) Psychological Warfare during Second World War.
   3) Role of U Boats during World War–II.
   4) Grand strategy of Allieds during World War Second.

4. Answer in **16** to **20** sentences (**any one**) :   **8**
   1) Explain in detail the Germans strategy during World War–I.
   2) Evaluate the role of Air Power during World War Second.

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T.Y. B.Sc. (Sem – IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – VIII)
DS 348(A) : Armed Forces and Society

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All questions are compulsory*.
           2) *Figures to the right indicate full marks*.

1. Answer in **2** to **4** sentences **each** :   **16**

   a) What do you mean by Military ?

   b) What is Human rights ?

   c) What do you understand by Defence ?

   d) What is Motivation ?

   e) What do you mean by values in Society ?

   f) What do you understand by Nation building ?

   g) What is National Integration ?

   h) What do you understand by Profession.

2. Answer in **8** to **10** sentences (**any two**) :   **8**

   a) Explain attributes to Institutional values.

   b) Explain the concept of Military Professionalism.

   c) Examine Motivation in Armed Forces.

3. Write short notes on **(any two)** : **8**

   a) Career Management.

   b) Fundamental Rights and Armed Forces.

   c) Military Psychology.

4. Answer in **16** to **20** sentences (**any one**) : **8**

   a) Discuss on the value-based education in society to build good soldiers.

   b) Discuss on Armed Forces still remains to be a shinning example of "Unity Diversity".

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T.Y. B.Sc. (Semester – IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – VIII)
DS 348(B) : Geopolitics

Time : 2 Hours   Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
             2) *Figures to the* ***right*** *indicate* ***full*** *marks.*

1. Answer in **2** or **4** sentences **each** :   **16**

    1) What do you mean by land locked states ?

    2) State any two geographical factors affecting on war.

    3) Define "Frontier".

    4) What do you mean by LOC ?

    5) State the meaning of "Maritime Boundaries.

    6) Write the long form of I.B.

    7) State any two problems of land locked states.

    8) What do you mean by Demarcations ?

2. Answer in **8** to **10** sentences (**any two**) :   **8**

    1) Explain the process of Delimitation.

    2) How 'location' affecting on conduct of war

    3) Write few lines on exclusive economic Zone.

    4) Write in short "classification of Boundaries".

3. Write short notes on (**any two**) :   **8**

    1) Concept of Border.

    2) Example of LOC.

    3) Impact of climate on war.

    4) Significance of Territorial water/sea.

4. Answer in **16** to **20** sentences (**any one**) :   **8**

    1) Discuss the problems and prospects of Buffer States.

    2) Highlight on contrast between frontiers and boundaries.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – IX)
DS 349 (A) : Defence and Production in India

Time : 2 Hours   Max. Marks : 40

*N.B. : 1) **All** questions are **compulsory**.*
*2) Figures to the **right** indicate **full** marks.*

1. Answer in **2** to **4** sentences **each** :   **16**
   a) What do you understand by Indigenisation.
   b) Who is the present Finance Minister of India ?
   c) Write full form of HAL.
   d) What is DRDO.
   e) Define Defence Policy.
   f) Write the objectives of DPSU.
   g) Write full form of GRSE.
   h) Name the present National Security Advisor of India.

2. Answer in **8** to **10** sentences (**any two**) :   **8**
   a) Write objectives of ordnance factories.
   b) Explain the structure of Defence Production in India.
   c) Explain the working of ordnance factories.

3. Write short notes on (**any two**) :   **8**
   a) Goa Shipyard Limited
   b) DRDO
   c) Defence Exhibition Organisation.

4. Answer in **16** to **20** sentences (**any one**) :   **8**
   a) Evaluate role of private sector in Defence Production in India.
   b) Highlight significant achievements of ordnance factories in India.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
DEFENCE AND STRATEGIC STUDIES (Paper – IX)
DS 349 (B) : Defence Management in India

Time : 2 Hours　　　　　　　　　　　　　　　　　　　　Max. Marks : 40

N.B. : 1) **All** questions are **compulsory**.
　　　　2) Figures to the **right** indicate **full** marks.

1. Answer in **2** to **4** sentences **each** :　　　　　　　　　　　**16**
　　1) Define logistic management.
　　2) What do you mean by 'Integrated defence' ?
　　3) State the meaning of weapon management.
　　4) What is operational management ?
　　5) What do you mean by strategic planning ?
　　6) Explain the meaning of 'Management Control'.
　　7) What is material life cycle ?
　　8) What do you mean by Defence Management ?

2. Answer in **8** to **10** sentences (**any two**) :　　　　　　　　　**8**
　　1) Explain Technological Forecasting.
　　2) Explain Economic Forecasting.
　　3) Explain Team Building.
　　4) Explain Organisational Aspects of Decision making.

3. Write short notes on (**any two**) :　　　　　　　　　　　　　**8**
　　1) Principles of operational logistics.
　　2) Integrated Defence Logistics.
　　3) Material Life Cycle.
　　4) Manpower Forecasting.

4. Answer in **16** to **20** sentences (**any one**) :　　　　　　　　**8**
　　1) Explain mobilization of logistics elements for war.
　　2) Write a note on Defence management in India.

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
EN – 341 : ENVIRONMENTAL SCIENCE – I
Environmental Quality Management

Time : 2 Hours　　　　　　　　　　　　　　　　　　　　　Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
　　　　　　　2) Neat diagrams must be drawn ***wherever*** *necessary.*
　　　　　　　3) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Attempt the following in **1-2** lines **each** :　　　　　　　　**10**

   a) What are coagulants ?

   b) What is the audible frequency range for human ?

   c) Define BOD.

   d) How is sound a longitudinal wave ?

   e) Define threshold of hearing.

   f) What are the constituents of sewage ?

   g) What is the audible sound pressure level (SPL) range ?

   h) Give any two disadvantages of chlorination.

   i) What is meant by psychosomatic effect of noise pollution ?

   j) What is sludge ?

2. Write short notes on **any two** of the following :　　　　　　**10**

   a) Mechanism of hearing in human with diagram.

   b) Oxidation pond with diagram.

   c) Secondary treatment of wastewater.

P.T.O.

3. Attempt **any two** of the following : **10**

   a) Describe the ion exchange method with suitable diagram.

   b) Explain in detail reverse osmosis process.

   c) How can a receiver be protected from damages of noise pollution ?

4. Attempt **any one** of the following : **10**

   a) Discuss the noise control measures which can be applied in the noise transmission path.

   b) Describe municipal wastewater treatment with suitable diagram.

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
ENVIRONMENTAL SCIENCE – II
EN - 342 : Natural Resource Management

Time : 2 Hours   Max. Marks : 40

N.B. : 1) *All* questions are *compulsory*.
         2) *Neat* diagrams must be drawn *wherever* necessary.
         3) Figures to the *right* indicate *full* marks.

1. Attempt the following in **1-2** lines :   **10**

   a) Define 'Biodiversity'.

   b) What is 'Endangered Species' ?

   c) Mention two major methods of biodiversity conservation.

   d) What are the factors responsible for biodiversity loss ?

   e) What is species richness ?

   f) Enlist the wildlife conservation projects in Maharashtra.

   g) Define 'Wetlands'.

   h) Mention any two Ramsar sites in India.

   i) What is water conservation ?

   j) Enlist any two traditional approaches for biodiversity conservation.

2. Write short notes on **any two** of the following :   **10**

   a) Effects of climate change on biodiversity.

   b) Traditional water management systems.

   c) Value of biodiversity.

3. Attempt **any two** of the following :　　　　　　　　　　　　　　**10**

   a) Comment on the threats to biodiversity.

   b) What are biodiversity hotspots ? Explain biodiversity hotspots in India.

   c) Explain how wetlands play an important role in conservation of water and biodiversity.

4. What is biodiversity loss ? Comment on loss in biodiversity of major ecosystems of the world.　　　　　　　　　　　　　　**10**

                    OR

What are the types of wetlands ? Explain the ecological status of wetlands in India, with suitable example from coastal areas.　　　　　　　　**10**

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T.Y. B.Sc. (Semester – IV) Examination, 2009
ENVIRONMENTAL SCIENCES – IV
EN – 344 : Environmental Management

Time : 2 Hours　　　　　　　　　　　　　　　　　　　　Max. Marks : 40

Instructions : 1) **All** questions are **compulsory**.
　　　　　　　 2) **Neat** diagrams must be drawn **wherever** necessary.
　　　　　　　 3) Figures to the **right** indicate **full** marks.

1. Attempt the following in **1-2** lines **each** :　　　　　　　**10**

    a) Define watershed.

    b) What is agroforestry ?

    c) Enlist two hydrological parameters considered in watershed project.

    d) Name 2 methods of soil conservation.

    e) What is roof water harvesting ?

    f) Mention 2 types of check dams.

    g) Define mulching.

    h) What is CCT ?

    i) Mention the meaning of biopesticides.

    j) Name any 2 land treatments in watershed.

2. Write short notes on **any 2** of the following :　　　　　　**10**

    a) Sustainable development

    b) Organic farming

    c) Land use mapping.

3. Attempt **any two** of the following :   **10**

   a) Compare economic and sustainable development.

   b) Discuss the role of local government mentioned in Agenda 21.

   c) What is the selection criteria for plantation in watershed ?

4. Attempt **any one** of the following :   **10**

   a) Correlate the concepts of organic farming and agroforestry with the theme of sustainable development.

   b) Explain the significance of physical and hydrological parameters in watershed development.

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
ENVIRONMENTAL SCIENCE
EN – 345 : Environmental Geoscience (Paper – V)

Time : 2 Hours   Max. Marks : 40

Instructions : 1) **All** questions are **compulsory**.
2) Neat diagrams must be drawn **wherever** necessary.
3) Figures to the **right** indicate **full** marks.
4) Use stensil map **wherever** necessary.

1. Attempt the following in **1-2** lines each :   **10**

   a) What are minerals ?

   b) Define : Barkhan.

   c) Who proposed the concept of Continental Drift ?

   d) What is Conrad discontinuity ?

   e) Define : True Deserts.

   f) What is Environmentalism ?

   g) Enlist any two characteristics of minerals.

   h) What are stalactiles ?

   i) Give any two problems to get direct knowledge about interior structure of Earth.

   j) What is meant by 'Plate Tectonics' ?

2. Write short notes on **any two** of the following :   **10**

   a) Transportational and Depositional work of wind.

   b) Conservation methods for minerals.

   c) Erosional work of glacier in detail.

3. Attempt **any two** of the following :   **10**

   a) Describe in detail the characteristics of Indian rainfall.

   b) Explain erosional and depositional feature by Karst topography.

   c) Write about Continental Drift theory of Wegener with respect to objectives, principles and basic premise.

4. Attempt **any one** of the following :   **10**

   a) Explain in detail Environmental damage caused by mining activities.

   b) Explain Delta formation by river with respect to conditions required, structure and classification.

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
ENVIRONMENTAL SCIENCE
EN – 346 : Applied Biology (Paper – VI)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
                 2) *Neat diagrams must be drawn* ***wherever*** *necessary.*
                 3) *Figures to the* ***right*** *indicate* ***full*** *marks.*

1. Attempt the following in **1-2** lines **each** :   **10**

   a) Define pyrolysis.

   b) Enlist garden types.

   c) What is ecotourism ?

   d) Define bioinformatics.

   e) Enlist industrial waste segregation methods.

   f) Give two applications of remote sensing.

   g) Define silviculture.

   h) Give one method of rain water harvesting.

   i) Importance of landscape designing.

   j) What is asymmetric garden ?

2. Write short notes on **any two** of the following :   **10**

   a) Aims, objectives and applications of ecotourism.

   b) Incineration.

   c) GIS.

3. Attempt **any two** of the following :   **10**

   a) Give principles and methods in landscape designing.

   b) Describe concepts and applications of bioinformatics.

   c) Give a detail account on vermicomposting.

4. Attempt **any one** of the following :   **10**

   a) Describe principle and practices of apiculture and sericulture.

   b) Discuss the legislative framework provided for hazardous waste management with respect to its collection and disposal.

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
INDUSTRIAL CHEMISTRY (Paper – V)
VOC-IND-CH–345 : Inorganic and Organic Based Industries – II
(Vocational Course)

Time : 2 Hours   Max. Marks : 40

N.B. : 1) ***All*** *questions are* ***compulsory.***
2) *Figures to the* ***right*** *indicate* ***full*** *marks.*
3) *Neat diagrams must drawn* ***wherever*** *necessary.*

1. Answer the following questions :   **10**

   a) What are cationic surfactants ? Give an example.

   b) How fibers are classified ?

   c) Define anti-inflammatory agents with one example.

   d) Give the constituents of shaving soaps.

   e) Give significance of $\overline{M}_n$ and $\overline{M}_w$.

   f) How thermocole is prepared ?

   g) How polymers are classified on the basis of origin ?

   h) Give any four uses of PVC.

   i) Define mordant; give its one example.

   j) Define antipyretic, with an example.

2. A) Answer **any two** of the following :   **6**

   a) Describe injection moulding.

   b) How penicillin G is prepared ?

   c) Give preparation of methyl orange.

P.T.O.

B) Answer **any two** of the following :   **4**

   a) What are nitro musks ? Give one example.

   b) What are pressure sensitive adhesives ? Give an example.

   c) Distinguish between thermoplastic and thermosetting resins.

3. Answer **any two** of the following :   **10**

  a) Write a note on vulcanization.

  b) Explain chemotherapeutic agents.

  c) Explain preparation of aspirin.

4. A) Discuss the preparation of detergent.   **6**

          OR

A) Discuss a method for manufacture of viscose rayon.

B) Answer **any one** of the following :   **4**

  a) Discuss the configuration of polymers.

  b) How vanillin is prepared ?

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
BIOTECHNOLOGY (Vocational)
BT – 345 : Animal Cell Biotechnology (Paper – V)

Time : 2 Hours   Max. Marks : 40

Instructions *: 1) Neat diagrams must be drawn **wherever** necessary.*
*2) **All** questions carry **equal** marks.*
*3) **All** questions are **compulsory**.*

1. Answer the following questions in short :   **10**

   a) Define erythropoisis.

   b) What are monoclonal antibodies ?

   c) What is aqarose ?

   d) What is FGC ?

   e) What is paracrine signaling ?

   f) What is lippofection ?

   g) Define epitope.

   h) Name any two anchorage dependent cells.

   i) What is HAT medium ?

   j) What is the function of transferin ?

2. Answer **any two** of the following :   **10**

   a) What are intecleurins ? Discuss their activities in brief.

   b) Discuss in brief the fluorescence activated cell sorter.

   c) What are hybridoma cell lines ? How are they prepared ?

3. Write short notes on **any two** : **10**

   a) Special secondary metabolite insulin.

   b) Trypsinization.

   c) MHC.

4. Attempt **any one** of the following : **10**

   a) Discuss in brief the design and working of bioreactor for large scale culture of animal cells.

   b) Discuss in brief the significance of peptide growth factors in the proliferation and differentiation of mammelian cells.

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T.Y. B.Sc. Semester – IV Examination, 2009
STILL PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION
(Vocational) Paper V
Video Basics

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* **All** *questions are* **compulsory**.
                          2) *Draw* **neat** *and labeled diagrams* **wherever** *necessary.*
                          3) *Figures to the* **right** *indicate* **full** *marks.*

1. Attempt **all** of the following :   **16**

    a) State the bandwidth of audio and video signals.

    b) What is the advantage of video tape over motion picture film ?

    c) Time in scanning is distance in picture. Comment.

    d) How is resolution of a TV picture specified ?

    e) What color standard is used in India ?

    f) What is meant by color hue ?

    g) How is mechanical video disc replayed ?

    h) What are the primary colors used in color TV ?

2. Attempt **any two** of the following :   **8**

    a) What are the principles on which camera tubes work ? Explain the principle,
       construction and working of vidicon camera tube.

    b) Explain the construction and working of color picture tube. What is the need for
       shadow mask ?

    c) What is a color vector diagram ? Discuss the PAL-B color standard.

3. Attempt **any two** of the following :   **8**

    a) Explain the principle of working of optical video disc, how is this replayed ?

    b) With a heat block diagram explain the working of magnetic video disc machine.

    c) Explain the working of record electronics in a VCR.

4. Attempt **any one** of the following :   **8**

   a) Give a block diagram and explain the working of a B/W TV receiver.

   b) Write short notes on :

      i) Describe one complete frame of add line interlaced scanning frame used in India.

     ii) Draw a neat labeled diagram of composite video signal. State the frequencies of horizontal and vertical sync pulse. What is the need for blanking pulse ?

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T. Y. B.Sc. (Sem. – IV) (Vocational) Examination, 2009
COMPUTER MAINTENANCE & EQUIPMENT
Paper – V: Entrepreneurship Development

Time : 2 Hours   Max. Marks : 40

N.B : 1) **All** *questions are* **compulsory**.
        2) *Figures to the* **right** *indicate* **full** *marks.*

1. Answer in **one** sentence :   **(1×10=10 Marks)**

   1) What is MSFC abbreviated form of ?

   2) What is an entrepreneurial opportunity ?

   3) State any two factors to be considered at the time of project selection.

   4) What is Public Ltd. Company ?

   5) State any two long-term sources of finance.

   6) What is personal selling ?

   7) What is borrowed capital ?

   8) If scale of operations is small, which type of organization is suitable ?

   9) State any two social responsibilities of an enterprise towards the suppliers.

   10) Who are the Drone Entrepreneurs ?

2. Answer **any two** from the following :   **(5×2=10 Marks)**

   1) Describe features of Entrepreneurship.

   2) Explain the demand oriented pricing policy.

   3) Explain importance of H.R.M.

3. Answer **any two** from the following : (5×2=10 Marks)

   1) Describe the features of small scale industries.

   2) Explain SOWT analysis.

   3) Explain "Apprenticeship training" as a method of training.

4. Answer the following : (1×10=10 Marks)

   1) What are the advantages of joint stock companies ?

                 OR

   2) What is project Appraisal ? Explain techno-economic analysis of Project Appraisal.

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T.Y. B.Sc. (Sem. – IV) (Vocational) Examination, 2009
SEED TECHNOLOGY
Paper – V : Seed Entomology

Time : 2 Hours   Max. Marks : 40

*Instructions : i) **All** questions are **compulsory**.*
*ii) Figures to the **right** indicate **full** marks.*
*iii) Draw labelled diagrams **wherever** necessary.*

1. Answers the following :   **(1×10=10)**

   a) Define pesticide.

   b) What is IPM ?

   c) Explain complete metamorphosis.

   d) What is Empodium ?

   e) Write names of any two pests of paddy.

   f) Give example of jumping type of leg.

   g) What is Nozzle ?

   h) What is insecta ?

   i) Give two examples of order lepidoptera.

   j) What is a borer ? Give example.

2. Attempt **any two** of the following :   **(2×5=10)**

   a) Fumigants and their uses.

   b) Describe any two pests of Kharif pulses.

   c) What are insecticide formulations ? Describe any two types.

3. Attempt **any two** of the following :   (2×5=10)

   a) What are insecticidal appliances ? Describe any one of them.

   b) Sketch, label and describe siphoning type of mouth parts.

   c) Write note on biological control.

4. What are store grain pests ? Describe any two store grain pests, their nature of damage and control measures.   **10**

                OR

Describe with examples and diagrams types of antennae in insects.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
INDUSTRIAL MICROBIOLOGY (Paper–V) (Vocational)
IND-MB-345 : Molecular Biology and Genetic Engineering

Time : 2 Hours   Max. Marks : 40

***Instructions** :* *1) Neat diagrams must be drawn **wherever** necessary.*
*2) Black figures to the **right** indicate **full** marks.*
*3) **All** questions carry **equal** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed.***
*5) Assume suitable data, if **necessary**.*
*6) **All** questions are **compulsory**.*

1. Answer the following as directed :   **10**
   i) Define chromosome walking.

   ii) Define cosmid.

   iii) Give any two examples of replacement vectors.

   iv) Agarose is convenient for separating DNA fragments ranging in size.
      a) 1-50 bases   b) Few hundred to 20 Kb.
      c) Greater than 20 Kb   d) 50-100 bases

   v) Pst I enzyme creates
      a) 5′ extensions   b) 3′ extensions
      c) Blunt ends   d) None of the above

   vi) Give the long form of Sma I

   vii) State whether **true** or **false** :

      Autoradiography is used to detect DNA segments using radiolabelled probes.

   viii) Relaxed plasmids are maintained as
      a) Limited copies per cell   b) 1-3 copies per cell
      c) Multiple copies per cell   d) Single copy per cell

   ix) What is RM system ?

   x) Give any two properties of bacteriophages as cloning vectors.

2. Attempt **any two** of the following :　　　　　　　　　　　　　**10**
   a) Recombinant vaccines
   b) Use of Ti-plasmid as a vector
   c) RT-PCR

3. Attempt **any two** of the following :　　　　　　　　　　　　　**10**
   a) Comment on PBR 322 as a cloning vehicle.
   b) Describe various methods used for screening of recombinant DNA.
   c) Protocol for protoplast fusion technique.

4. Attempt **any one** of the following :　　　　　　　　　　　　　**10**
   a) Enlist various methods of DNA sequencing and explain any one in details.

   　　　　　　OR

   b) What is Ti-plasmid ? Explain how it is used in agricultural microbiology.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
Electronic Equipment and Maintenance
Vocational – EEM – 345 : (Paper – V)
ENTREPRENEURSHIP DEVELOPMENT

Time : 2 Hours   Max. Marks : 40

Instructions :*1*) ***All*** *questions are* ***compulsory****.*
                    2) Figures to the ***right*** *indicate* ***full*** *marks.*
                    3) ***Use*** *of log-tables, calculator is* ***allowed****.*

1. Answer the following :   **(3×4=12)**

   a) Answer the following :   **(4×1=4)**

      i) State any two characteristics of an entrepreneur.

      ii) What is meant by the term product mix ?

      iii) Define the term 'entrepreneurship development'.

      iv) State two differences between entrepreneur and manager.

   b) Comment on the following :   **(2×2=4)**

      i) Cooperative organisation is based on service motive rather than profit motive.

      ii) A shareholder of joint stock company has limited liability.

   c) Answer the following :   **(2×2=4)**

      i) Explain the term 'market segmentation'.

      ii) State the importance of communication in corporate life.

2. Answer **any two** of the following :   **(2×4=8)**

   a) Explain the functions of an entrepreneur.

   b) Discuss advantages and limitations of partnership.

   c) Explain the role of state finance corporation in promotion of Small Scale Industry.

3. Answer **any two** of the following : **(2×4=8)**

   a) Explain the role of Small Scale Industry in Economic Development.

   b) What is meant by costing and pricing of a product ?

   c) Explain the functions of human resource development in brief.

4. Answer the following : **(2×6=12)**

   a) What are the objectives of conducting market surveys ? Give advantages and limitations of postal survey and personal interview methods.

   b) Explain objectives and functions of Small Business Management.

                   OR

4. Answer the following : **(3×4=12)**

   a) Discuss the considerations involved in selection of a product or service for starting a business.

   b) Explain the term Cash Flow. What is Cash Flow Statement ?

   c) Explain what is meant by project appraisal.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
INDUSTRIAL CHEMISTRY (Paper – VI)
VOC-IND-CH 346 : Industrial Methods of Chemical Analysis – II
(Vocational Course)

Time : 2 Hours   Max. Marks : 40

N.B : 1) *All* questions are *compulsory*.
      2) Figures to the *right* indicate *full* marks.
      3) *Neat* diagrams must be drawn *wherever* necessary.
      4) *Use* of calculator/Logarithmic table is *allowed*.
      5) Assume suitable additional data if *necessary*.

1. Answer precisely the following :   **10**

   a) State the difference between voltammetry and polarography.

   b) Define the term, 'Half-wave potential'.

   c) Give the principle of hydrodynamic voltammetry.

   d) Give the energy range in joules of x-rays.

   e) State the origin of x-ray fluorescence.

   f) Define the term 'parent ion' as used in mass spectrometry.

   g) Define hard method of ionization.

   h) What is the temperature of a flame when natural gas and air is used as fuel and oxidant respectively ?

   i) Why do free neutrons not exist ?

   j) Give an example of polycrystalline ion-selective membrane electrode.

2. A) Answer the following (**any two**) :   **6**

   a) Write Ilkovic equation and give the significance of the terms involved in it.

   b) Discuss briefly the technique of pulse polarography.

   c) Discuss the theory of ion-selective electrodes.

B) Answer briefly the following (**any two**) :   **4**

   a) Draw a neat labelled diagram of an x-ray tube.

   b) How are thermal neutrons produced ?

   c) Give the characteristics of total consumption burner.

3. Answer the following (**any two**) :   **10**

   a) Write and explain the flame processes observed in flame photometry.

   b) Describe the glass electrode with a neat labelled diagram.

   c) Calculate the mass absorption coefficient at 0.436 nm of an alloy containing of
      85% Fe, 5% Ni, 9% Cu and 1% Zn. The mass absorptive coefficients for the
      pure elements at 0.436 nm are 610, 715, 760 and 910 cm^2/g respectively for
      Fe, Ni, Cu and Zn.

4. A) Describe the construction and working of semiconductor detector used in an
      x-ray absorption.   **6**

                         OR

   A) Write the applications of mass spectrometry.   **6**

   B) Answer the following (**any one**) :   **4**

      a) The accelerating potential in an x-ray tube was 25.0 KV. Calculate the short
         wavelength cutoff of the lamp.

      b) A time-of-flight mass spectrometer has a flight path of 1.00 m and uses an
         accelerating potential of 2400 V. Calculate the time required for ionic fragment
         with $\dfrac{m}{z}$ 100 to strike the detector.

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T.Y.B.Sc. (Semester IV) Examination, 2009
BIOTECHNOLOGY (Vocational)
BT–346 : Microbial Biotechnology (Paper – VI)

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***Neat*** *diagrams* ***must*** *be drawn.*
                         2) ***All*** *questions carry* ***equal*** *marks.*
                         3) ***All*** *questions are* ***compulsory****.*

I. Give short answers for the following questions :   **10**

   a) What is Blanching ?

   b) Define F-value.

   c) What is Pasteurization ?

   d) Define the term antidotes.

   e) Define Toxoid.

   f) What is process patent ?

   g) What are lines ?

   h) Name any one organism for degradation of oil.

   i) Define food poisoning.

   j) What are PHB granules ?

II. Attempt **any two** of the following questions :   **10**

   a) Give the characteristics and mode of action of Diptheria toxin.

   b) What are aflatoxins ? Comment on its structure, source and toxicity.

   c) Discuss in brief any two non-viral delivery method of vaccines.

III. Write short notes for the following (**any two**) :   **10**

   a) Zearalenones

   b) Tetanus toxin

   c) Intellectual property Rights (IPR).

IV. Attempt **any one** of the following question :   **10**

   a) What is a Bioreactor ? Discuss its construction and working.

           OR

   b) What are vaccines ? How are they classified ? Give the role of Nucleic acid vaccines.

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T.Y. B.Sc. (Sem. – IV) Examination, 2009
COMPUTER MAINTENANCE
Vocational Paper – VI : Network Operating System

Time : 2 Hours   Max. Marks : 40

1. Answer the following in **one**/**two** sentences :   **(1×10=10)**
   1) What is Network Operating System ?
   2) What is server ?
   3) State supervisor in N.O.S.
   4) Define logical partition.
   5) State any two utilities of N.O.S.
   6) Define KDE.
   7) "Novell Netware provide better security than windows" – comment.
   8) Define group in windows network O.S.
   9) State any two objects of directory services in Linux.
   10) What is Z.E.N. Works ?

2. Attempt **any two** :   **(5×2=10)**
   1) Explain objectives of Network Operating Systems.
   2) Explain minimal Hardware requirement of windows network operating system.
   3) Explain desktop environment of Linux.

3. Attempt **any two** :   **(5×2=10)**
   1) Explain Novell directory services.
   2) Explain role of supervisor in Novell and Administrator in Linux.
   3) Explain steps involved to create groups in windows.

4. Attempt **any one** :   **(10×1=10)**
   1) Explain Linux commands used to handle the files and directory.

                          OR

   1) Classify the servers and explain each in detail.

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T.Y.B.Sc. (Semester – IV) (Vocational) Examination, 2009
SEED TECHNOLOGY
Paper – VI : Seed Farm Management and Marketing

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory.***
                         2) Figures to the ***right*** *indicate* ***full*** *marks.*
                         3) Sketch ***neat*** *labelled diagrams* ***wherever*** *necessary.*

1. Answer the following :   **(10×1=10)**

   a) What is dry land farming ?

   b) Define seed pricing.

   c) What is field efficiency ?

   d) Give the basic concept of marketing.

   e) What is farm business ?

   f) Enlist any two factors affecting profit of farm.

   g) Give the advantage of mixed cropping.

   h) What are breeder seeds ?

   i) What are the weeds ?

   j) Define farm budgeting.

2. Attempt **any two** of the following :   **(2×5=10)**

   a) Explain the most profitable combination of inputs and outputs.

   b) Write an account on seed transportation and storage.

   c) Write about the selection and management of machinery.

3. Write notes on **any two** of the following :   (2×5=10)

    a) Basic principles in farm management.

    b) Storage structures.

    c) Farm records and their uses.

4. a) Explain any four operations undertaken for crop production.   **10**

                    OR

    a) Give an account of acquisition and management of land labour.

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T.Y.B.Sc. (Sem. – IV) Examination, 2009
VOC-IND-MB – 346 : INDUSTRIAL MICROBIOLOGY
(Vocational) (Paper – VI)
Industrial Management, Law and Taxation

Time : 2 Hours   Max. Marks : 40

*Instructions : 1) Neat diagrams must be drawn **wherever** necessary.*
*2) Black figures to the **right** indicate **full** marks.*
*3) **All** questions carry **equal** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*
*6) **All** questions are **compulsory**.*

1. A) Choose the correct option and write it only once :   **10**

   i) Which of the following is the most important step in the marketing process ?

      a) Collection of data

      b) Analysis of data

      c) Sampling design

      d) Defining research objective

   ii) Which of the following can be termed as the process of identifying groups or set of potential customers at either the national level or sub national level who are likely to exhibit similar ?

      a) Targeting

      b) Segmentation

      c) Positioning

      d) Branding

iii) In the _____ stage of the product life cycle, sales grow at an increasing rate, many competitors enter the market and profits rise rapidly.

   a) Introduction

   b) Growth

   c) Maturity

   d) Decline

iv) Insurance policy is an example of _____

   a) Convenience products

   b) Shopping products

   c) Speciality products

   d) Unsought products

v) New product development starts with _____

   a) Idea generation

   b) Idea screening

   c) Concept development

   d) Concept testing

vi) The minimum number of persons required to form a public company_____

   a) 15   b) 10

   c) 07   d) None of the above

B) State whether **true** or **false** :

   vii) Staffing is one of the management function.

   viii) The values, aspirations and needs of the rural people vastly differ from that of urban.

   ix) Suppliers are micro environmental force.

   x) Sale forecast is an estimate of sales for a specified future period which is expressed in terms of Rupees or Units.

2. Attempt **any two** of the following : **10**

   a) On what basis, markets can be segmented ?

   b) Explain the following terms :
      i) Product line
      ii) Length, width and depth of the product line
      iii) Product mix.

   c) Explain how other functions in an organisation have interface with production ?

3. Attempt **any two** of the following : **10**

   a) Evaluate the preference shares as a source of finance.

   b) State and explain the limitation of marketing research.

   c) Describe in details 'fixed cost' and 'variable cost'.

4. Attempt **any one** of the following : **10**

   a) Define the term 'price'. What factors influence the pricing decisions ?

   b) Discuss the role of entrepreneur in developing Indian economy.

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T.Y. B.Sc. (Semester – IV) Examination, 2009
ELECTRONIC EQUIPMENT & MAINTENANCE (Vocational)
VOC – EEM – 346 (Paper – VI)
Medical Instrumentation

Time : 2 Hours   Max. Marks : 40

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Figures to the ***right*** *indicate* ***full*** *marks.*
3) Use of log table, calculator is ***allowed****.*

1. Answer the following :

   a) Answer the following :   **(4×1=4)**

      i) Give the basic principle of electromyogram.

      ii) State the features of microelectrode.

      iii) What is ERG ?

      iv) State the two basic types of epilepsy.

   b) Answer the following :   **(2×2=4)**

      i) Explain in short the anatomy of heart.

      ii) Sketch the waveform of ECG signal.

   c) Answer the following :   **(2×2=4)**

      i) Enlist the properties of bioelectric amplifier.

      ii) What is fibrillation ?

2. Answer **any two** of the following :   **(2×4=8)**

   a) Explain the techniques of biomedical signal analysis.

   b) Write a note on electrodes used for electric stimulation of tissue.

   c) Illustrate with a neat diagram the working of prism monochromator.

P.T.O.

3. Answer **any two** of the following : **(2×4=8)**

   a) Write a short note on electrical safety codes and standards.

   b) Discuss various approaches for protection against electric shock while handling medical equipments.

   c) Explain anatomy and function of brain.

4. Answer the following : **(2×6=12)**

   a) What is meant by ion analyzer ? Draw a block diagram of a microprocessor based ion analyzer and explain each block in brief.

   b) Explain volume conductor field problem in detail.

                    OR

4. Answer the following : **(2×6=12)**

   a) What are the basic requirements of microelectrode ? State the types of microelectrode. Explain any one type in detail.

   b) Explain the function of following subsystems used in automated biochemical analyzer :
      i) Recorder
      ii) Colorimeter
      iii) Sampling unit
      iv) Regulated dc power supply.

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