



[4217] – 447

Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
STATISTICS (Principal) (Paper – V)
ST-345 : Operations Research
(2008 Pattern)

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. Attempt **each** of the following :

a) Choose correct alternative in **each** of the following. **(1 each)**

i) The coordinates of the corner points of the graphical region of feasible solution of an LPP are A(2, 3), B(2, 0), C(3, 2), D(0, 3). If the objective function of LPP is to maximize $Z = 4X_1 - 3X_2$ then the optimal solution is

- A) $\{X_1 = 2, X_2 = 3\}$
- B) $\{X_1 = 2, X_2 = 0\}$
- C) $\{X_1 = 3, X_2 = 2\}$
- D) $\{X_1 = 0, X_2 = 3\}$

ii) In the general definition of an assignment problem, X_{ij} is always

- A) 0 B) -1 C) 1 D) 1 or 0

iii) In a transportation problem, the least cost method is used

- A) to find initial solution
- B) to find optimal solution
- C) to find alternate solution
- D) to find initial basic feasible solution

P.T.O.



- iv) In MODI method of optimizing TP, an alternate solution to TP exists when
- A) optimality criterion is satisfied and net evaluation (d_{ij}) in any non basic square is zero.
 - B) there are exactly m squares having positive allocations.
 - C) the net evaluation (d_{ij}) in any nonbasic square is negative.
 - D) the net evaluation (d_{ij}) in any one basic square is positive.

b) In **each** of the following cases state whether the given statement is **true** or **false**. **(1 each)**

- i) If the primal LPP has an unbounded solution then its dual has infeasible solution.
- ii) Vogel's approximation method (VAM) is used to check the optimality of a solution of a transportation problem.

c) Define **each** of the following : **(1 each)**

- i) A slack variable
- ii) Degenerate solution of TP.

d) i) Explain the general sequencing problem. **1**

ii) Write the standard form of LPP. **1**

2. Attempt **any two** of the following : **(5 each)**

a) Using graphical method, solve the following LPP.

$$\text{Minimize } Z = 6x_1 + 4x_2$$

$$\text{Subject to } 3x_1 + x_2 \geq 24$$

$$x_1 + x_2 \geq 16$$

$$2x_1 + 6x_2 \geq 48$$

$$x_1, x_2 \geq 0.$$



- b) A company has factories at A, B, C which supply material to warehouses at D, E, F and G. Monthly factory capacities are 160, 150 and 190 units respectively. Monthly warehouse requirements are 80, 90, 110 and 160 units respectively.

Following table indicates per unit transportation cost (in Rs) from factories to warehouses.

To From	To			
	D	E	F	G
A	42	48	38	37
B	40	49	52	51
C	39	38	40	43

Obtain IBFS by Least Cost Method and find the cost of transportation.

- c) Find the sequence of jobs that minimizes total elapsed time (in hrs) required to complete the following jobs. Each job is to be processed on two machines M_1 and M_2 in the order $M_1 M_2$.

Job	1	2	3	4	5	6
Machine M_1	3	10	5	2	9	11
Machine M_2	8	8	9	6	3	1

Obtain the total elapsed time and idle time for both machines.

3. Attempt **any two** of the following : **(5 each)**

- a) A car hire company has one car in each of four depots D_1, D_2, D_3 and D_4 . A customer in each of four cities C_1, C_2, C_3, C_4 requires a car. The distance (in km) between the depots and cities is as follows :

Depots	Cities			
	C_1	C_2	C_3	C_4
D_1	160	135	50	55
D_2	130	120	50	35
D_3	190	160	80	80
D_4	200	175	110	105

How should the cars be assigned to the customers so as to minimize the total distance travelled ?



b) Solve the following LPP by simplex method.

$$\begin{aligned} &\text{Maximize } Z = 6x + 4y \\ &\text{Subject to } 2x + 3y \leq 30 \\ &\quad \quad \quad 3x + 2y \leq 24 \\ &\quad \quad \quad x, y \geq 0. \end{aligned}$$

c) Write a short note on Monte Carlo method of simulation using a suitable example.

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

a) i) An animal feed company must produce 200 Kg of a mixture consisting of ingredients x_1 and x_2 daily. x_1 costs Rs 3 per kg and x_2 costs Rs 8 per kg. No more than 80 kg of x_1 can be used and at least 60 kg of x_2 must be used.

Formulate the LPP so as to find how much of each ingredient should be used so as to minimize the cost.

5

ii) Write any three assumptions made in solving sequencing problem.

3

iii) State the criteria used in simplex method for deciding whether an LPP has

i) infeasible solution

ii) unbounded solution.

2

b) i) Write the dual of the following LPP.

$$\begin{aligned} &\text{Maximize } Z = 2x_1 + 3x_2 + x_3 \\ &\text{Subject to} \\ &\quad \quad \quad 4x_1 + 3x_2 + x_3 \leq 6 \\ &\quad \quad \quad x_1 + 2x_2 + 5x_3 \leq 4 \\ &\quad \quad \quad x_1, x_2, x_3 \geq 0 \end{aligned}$$

3

ii) Following table indicates per unit cost of transportation of articles from warehouses W_1, W_2, W_3 to stores S_1, S_2, S_3 and S_4 along with the availability and requirement.

From \ To	S_1	S_2	S_3	S_4	Availability
W_1	15	10	17	18	20
W_2	16	13	12	13	60
W_3	12	17	20	11	70
Requirement	30	30	40	50	

Find the optimal solution to above TP by obtaining IBFS using VAM.

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T.Y. B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – II)
MT-332 : Real Analysis (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**

i) Does the series $\sum_{n=1}^{\infty} \log\left(2 + \frac{1}{n}\right)$ converge ?

ii) Justify whether true or false : If a sequence $\{S_n\}$ is bounded above, then $-\infty < \limsup S_n < \infty$.

iii) Let σ_n be the subdivision $\left\{0, \frac{1}{n}, \frac{2}{n}, \dots, \frac{n}{n}\right\}$ of $[0, 1]$. If $f(x) = x$, $0 \leq x \leq 1$, then find $\lim_{n \rightarrow \infty} U[f; \sigma_n]$.

iv) Show that the series $\sum_{n=1}^{\infty} \frac{n!}{n^n}$ is convergent.

v) Let $f_n(x) = \frac{x^n}{n}$, $0 \leq x \leq 1$. Show that $\{f_n\}_{n=1}^{\infty}$ converges uniformly to 0 on $[0, 1]$.

vi) Does the power series $\sum_{h=0}^{\infty} \frac{x^h}{h!}$ converge uniformly on $[-100, 100]$?

vii) Let χ_n be the characteristic function of the open interval $\left(0, \frac{1}{n}\right)$ and let

$f_n(x) = n \chi_n$, $0 \leq x \leq 1$. Find $\lim_{n \rightarrow \infty} \int_0^1 f_n$.

P.T.O.



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

i) Let $\{S_n\}$ be a bounded sequence and let $\limsup S_n = M$. Prove that for every $\epsilon > 0$, $S_n > M - \epsilon$ for infinitely many values of n .

ii) If $a_n = \frac{1}{\sqrt{n}} + \frac{(-1)^n}{n}$, discuss the convergence of the series $\sum_{n=1}^{\infty} (-1)^{n+1} a_n$.

iii) If $f \in R[a, b]$, then prove that $|f| \in R[a, b]$. Is the converse true? Justify.

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

i) State and prove Weierstrass M-test for uniform convergence of series of functions.

ii) Let $f_n(x) = \frac{x}{n} e^{-x/n}$, $0 \leq x < \infty$. Show that $\{f_n\}_{n=1}^{\infty}$ converges pointwise on $[0, \infty)$, but not uniformly.

iii) Justify whether true or false : If $f \in R[a, b]$ and $f(x) = g(x)$ except for a countable number of points $x \in [a, b]$, then $g \in R[a, b]$.

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

i) a) If $\{a_n\}_{n=1}^{\infty}$ is a non-increasing sequence of positive real numbers and if

$$\sum_{n=1}^{\infty} a_n \text{ converges, then prove that } \lim_{n \rightarrow \infty} n a_n = 0.$$

b) Give an example of a sequence of functions $\{f_n\}_{n=1}^{\infty}$ on $[0, 1]$ such that

$\{f_n\}_{n=1}^{\infty}$ converges uniformly on $[0, 1]$ but $\{f'_n\}_{n=1}^{\infty}$ does not converge uniformly on $[0, 1]$.

ii) a) If $f \in R[a, b]$, if $F(x) = \int_a^x f(t) dt$ and if f is continuous at $x_0 \in (a, b)$, then show that $F'(x_0) = f(x_0)$.

b) Deduce the equation $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots$ from the equation

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$$



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T.Y.B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – III)
MT 333 : Problem Course Based on MT-331 and MT-332
(2008 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.**
 - 4) **Tie answer books of both Sections together.**

SECTION – I

(Set Theory and Logic)

1. A) Attempt **any three** of the following : **6**
- i) What is the truth value of $\forall xP(x)$ where $P(x)$ is the statement " $x^2 < 10$ " and the domain consists of positive integers not exceeding 3 ?
 - ii) Give an example of a relation which is symmetric and transitive but not reflexive.
 - iii) What rule of inference is used in the argument "All men are mortal. Socrates is a man. Therefore, Socrates is mortal".
 - iv) State the principle of duality. Write dual of the statement $A \cup (A \cap B) = A$.
- B) Attempt **any one** of the following : **4**
- i) Show that \mathbb{R} is similar to $(0, 1)$
 - ii) What are the negations of the statements $\forall x(x^2 > x)$ and $\exists x(x^2 = 2)$?

P.T.O.



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

10

- i) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.
- ii) For the following set of premises what relevant conclusion or conclusions can be drawn ? Explain the rule of inference used to obtain each conclusion from premises.

“ If I take the day off, it either rains or snows”.

“ I took Tuesday off or I took Thursday off”.

“ It was sunny on Tuesday”.

“ It didnot snow on Thursday”.

iii) If A, B, C and D are sets then show that

$$(A \cap B) \times (C \cap D) = (A \times C) \cap (B \times D).$$

Is $(A \cup B) \times (C \cup D) = (A \times C) \cup (B \times D)$? Justify.

SECTION – II
(Real Analysis)

3. A) Attempt **any three** of the following :

6

i) Give an example of a bounded sequence $\{S_n\}_{n=1}^{\infty}$ which is not convergent.

ii) Prove that $\sum_{n=1}^{\infty} \frac{1}{n^2 + x^2}$ is uniformly convergent on $[0, \infty)$.

iii) Let f be a function defined on $[0, 1]$ defined by $f(x) = 1$; x is rational
 $= -1$; x is irrational.

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

iv) Show that the sequence $\{x^n\}_{n=1}^{\infty}$ converges pointwise on $[0, 1]$.



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

i) Show that the series $\sum_{n=0}^{\infty} x(1-x)^n$ converges on $[0, 1]$ but does not converge uniformly on $[0, 1]$.

ii) Show that the sequence $\{f_n\}_{n=1}^{\infty}$ where $f_n(x) = \frac{1}{n} e^{-nx}$ ($0 \leq x < \infty$) converges uniformly on $[0, \infty)$.

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

i) Prove that $\int_0^1 \sum_{n=1}^{\infty} \frac{x^n}{n^2} dx = \sum_{n=1}^{\infty} \frac{1}{n^2(n+1)}$.

ii) Evaluate $\lim_{n \rightarrow \infty} \frac{1}{n} \left[e^{3/n} + e^{6/n} + e^{9/n} + \dots + e^{3n/n} \right]$

iii) Test the convergence of the series $\sum_{n=4}^{\infty} \frac{1}{n \log n}$.



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T.Y. B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – VII & VIII) (Ele. – I)
MT-337 : Lattice Theory (2008 Pattern)

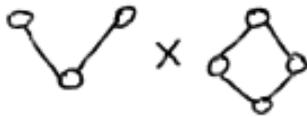
Time : 2 Hours

Max. Marks : 40

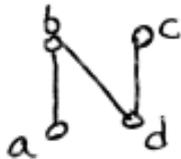
N.B. : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Attempt **any five** of the following : **10**

- i) Give an example of a Lattice which is modular but not distributive.
- ii) Draw the diagram of the product.



iii) Write all down sets of the poset.



- iv) Define : Boolean lattice
- v) Write the duals of the following statements.
 - a) If z is an upper bound of $\{x, y\}$, then $x \vee y \leq z$
 - b) $a \wedge b \leq a \leq a \vee b$
- vi) In a Boolean algebra, show that $(a')' = a$ for all $a \in B$.
- vii) Give an example of Lattice, which satisfies both ascending and descending chain conditions.

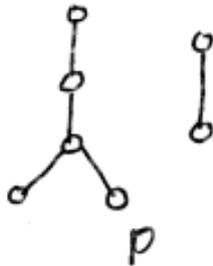
P.T.O.



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

10

i) Let P be the 7-element ordered set as shown in following fig



a) Explain why $|\varphi(P)| \neq 28$.

b) Find the correct value for $|\varphi(P)|$.

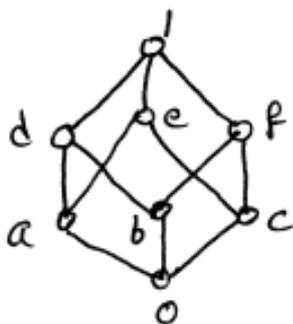
ii) Draw the diagram of the Lattice $P(\{1, 2, 3\})$ under inclusion. Show that it is same as that of the product of three chains with two elements.

iii) Show that an ordered set P has no infinite chain if and only if it satisfies both ascending and descending chain conditions.

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

10

i) Let L be lattice as shown below :



a) Is $M = \{a, c, d, f, l\}$ sublattice of L ? Justify

b) Is $K = \{o, d, e, l\}$ sublattice of L ? Justify

ii) Show that two Lattices L and M are distributive if and only if $L \times M$ is distributive.

iii) Show that the set N-sub G of normal subgroups of group G is modular lattice under operations

$$H \wedge K = H \cap K \text{ and } H \vee K = HK, \text{ with } \subseteq \text{ as underlying order.}$$



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

10

i) a) Prove that L is non-modular if and only if L has a sublattice isomorphic to N_5 (i.e $N_5 \rightarrow L$)

b) Draw the lattice of subgroups of the group $Z_2 \times Z_4$. Also find all its join-irreducible and meet-irreducible elements.

ii) a) Let B be a boolean ring and define \vee and \wedge on B by

$$x \vee y = x + y + xy, \quad x \wedge y = xy, \quad x' = 1 + x$$

Show that $\langle B; \vee, \wedge, ', 0, 1 \rangle$ is a Boolean algebra.

b) Show that every chain is distributive.



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T.Y. B.Sc. (Semester – III) Examination, 2012
PHYSICS (Paper – III) (New)
PH-333 : Classical Mechanics
(2008 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 (1 mark each) : **10**
- a) Find the range of the projectile fired with initial velocity of 9.8 m/s.
 - b) Draw the trajectory of a charged particle moving in a constant magnetic field.
 - c) What is geostationary orbit of a satellite ?
 - d) State Kepler's third law of planetary motion.
 - e) Give the example of inelastic scattering.
 - f) Define the term 'cross-section' in scattering process.
 - g) Specify the nature of constraint in case of a rigid body.
 - h) What are generalized co-ordinates ?
 - i) Define the term frame of reference.
 - j) What is Coriolis force ?
2. Attempt **any two** of the following :
- a) Show that a two-body problem can be reduced to an equivalent one body problem. **5**
 - b) Obtain the relation between scattering angles in the LAB and CM systems. **5**
 - c) Show that the Hamiltonian of a system represent total energy of the system. **5**

P.T.O.



3. Solve **any two** of the following :
- a) Two particles of masses 5 gm and 10 gm approaches to each other with velocities of 5 m/s and 10 m/s respectively. After collision first particle comes to rest. Find the velocity of second particle. **5**
 - b) A geostationary satellite is orbiting the earth at a height of $11 R_e$ above the surface of earth. Calculate the time period of another satellite at height of $5 R_e$ from the surface of earth ($R_e =$ radius of earth). **5**
 - c) A bullet is fired horizontally in the north direction with a velocity of 500 m/s at $30^\circ N$. Calculate the horizontal component of Coriolis acceleration and the Coriolis force if mass of bullet is 10 gm. **5**
4. A) Attempt **any one** of the following :
- a) Explain the principle of rocket motion. Obtain an expression for the instantaneous height attained by the rocket. **8**
 - b) Give the advantages of Lagrangian formulation. Use Lagrange's equation to obtain equation of motion for a simple pendulum. **8**
- B) Attempt **any one** of the following :
- a) What is centre of mass of a system ? **2**
 - b) State the principle of Galilean invariance. **2**



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T.Y. B.Sc. (Semester – III) Examination, 2012
PHYSICS (Paper – VI) (New) (Elective – I)
PH-336(A) : Astronomy and Astrophysics – I
(2008 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 diagrams **wherever** necessary.

1. Attempt **all** of the following (**1** mark **each**) : **10**
- a) What is meant by variable stars ?
 - b) What is a solar flare ?
 - c) What are peculiar galaxies ?
 - d) Differentiate between a transit and occultation.
 - e) What is the use of image intensifier tube ?
 - f) What are white Dwarfs ?
 - g) Define the term 'Resolving power' of a telescope.
 - h) What are Binary Stars ?
 - i) State Kepler's laws of planetary motion.
 - j) What is the disadvantage of Newtonion telescope ?
2. Attempt **any two** : **5**
- a) What is interferometry ? Where is it used ? **5**
 - b) Write a short note on HST. **5**
 - c) What is butterfly diagram ? **5**
3. Attempt **any two** : **5**
- a) What is Dark Matter and Dark Energy ? **5**
 - b) Give the classification of Galaxies. **5**
 - c) Explain the various types of Eclipses in detail. **5**
4. A) Attempt **any one** : **8**
- a) What are the spectral characteristics of O, B, A, F, G, K, M stars ? **8**
 - b) Describe various types of Binary stars. **8**
- B) Attempt **any one** : **2**
- a) What is neutron star ? **2**
 - b) What is H-R diagram ? **2**

P.T.O.



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T.Y.B.Sc. (Semester – III) Examination, 2012
PHYSICS (Paper – VI) (Elective – I)
PH-336(B) : Biophysics
(2008 Pattern) (New)

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 (1 mark each) : **10**
- a) Define Bond angles.
 - b) Define Gibbs' free energy.
 - c) Give the composition of a cell.
 - d) What is chloroplast ?
 - e) Define Redox-couple.
 - f) Write the equation explaining photosynthesis.
 - g) Define CMRR.
 - h) List the different leads of ECG.
 - i) What is full form of EEG and EOG ?
 - j) What is the full form of LVDT ?
2. Attempt **any two** of the following :
- a) Explain the role of PS I and PS II in the photosynthesis process. **5**
 - b) Explain polarizable and non-polarizable electrodes. **5**
 - c) Explain the construction and working of pH-meter. **5**



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

- a) What is Redox-couple ? Explain redox-potential. 5
- b) Explain construction and working of spectro-photometer. 5
- c) Explain how NMR technique is useful for structural determination. 5

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

- a) What is neuron ? Discuss structure and function of neuron and state Nernst equation. 8
- b) What is electron microscope ? Explain in brief the principle and construction of SEM and TEM. 8

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

- a) What is 'Hydrogen bonding' ? 2
- b) Write uses of X-ray. 2



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T.Y. B.Sc. (Semester – III) Examination, 2012
PHYSICS (Paper – VI) (Elective – I)
PH-336(C) : Motion Picture Physics – I
(New) (2008 Pattern)

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 (**one mark each**) :
 - a) Draw diagram of condenser enlarger.
 - b) What is gamma value of film ?
 - c) List the lights which are used in photography.
 - d) List the different types of filters.
 - e) State different aberrations in lens.
 - f) What is rush printing ?
 - g) State essential parts of projector.
 - h) Explain freeze action in brief.
 - i) What is flat perspective ?
 - j) Write E-6 colour process in brief.

 2. Attempt **any two** of the following (**5 marks each**) :
 - a) Explain film format in detail.
 - b) Explain intermittent mechanism in detail.
 - c) Explain any two Laboratory special effects.

 3. Attempt **any two** of the following (**5 marks each**) :
 - a) Explain formats of projection screen.
 - b) Explain factors affecting developing process.
 - c) State different types of shutter and explain any one type in brief.

 4. A) Attempt **any one** of the following : **8**
 - a) Explain contact printing and projection printing.
 - b) Explain construction, working and features of TLR camera.

 - B) Attempt **any one** of the following : **2**
 - a) List essential parts of movie camera.
 - b) Define angle of view and depth of field.
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T.Y.B.Sc. (Semester – III) Examination, 2012
PHYSICS (Paper – VI) (New Course) (Elective – I)
PH-336(D) : Medical Electronics
(2008 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 diagrams wherever necessary.*

1. Attempt **all** of the following (**1 mark each**) : **10**
- a) State the basic principle of transducer.
 - b) Draw circuit symbol of OPAMP.
 - c) What do you mean by impedance ?
 - d) State the difference between active and passive filter.
 - e) State the uses of chromatography.
 - f) What are bio-potential electrodes ?
 - g) What is the normal range of WBC count in human being ?
 - h) What is sensor ?
 - i) What is hematology ?
 - j) What is electrophoresis ?
2. Attempt **any two** :
- a) What is polarization ? Explain polarizable and non polarizable electrodes in brief. **5**
 - b) Explain the OPAMP as integrator with the help of a suitable diagram. **5**
 - c) Write a short note piezoelectric transducer. **5**



3. Attempt **any two** :

- a) Explain blood gas and acid base measurement. 5
- b) Draw a block diagram of X-ray machine. Explain each block in brief. 5
- c) Why are instruments essential in electronics ? 5

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

- a) What is plethysmography ? Explain the working of plethysmograph in brief. 8
- b) Give difference between short wave diathermy and microwave diathermy. 8

B) Attempt **any one** :

- a) Define diastolic blood pressure. 2
 - b) Explain the basic principle of capacitive transducer. 2
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T.Y.B.Sc. (Semester – III) Examination, 2012
PHYSICS (Paper – VI) (New) (Elective – I)
PH-336(E) : Elements of Material Science
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

1. Attempt **all** of the following (1 mark **each**) : **10**
- a) Define term 'hardness'.
 - b) State characteristics of polymer.
 - c) What is solid solution ?
 - d) State Gibb's phase rule.
 - e) What are ferrites ?
 - f) Define dielectric strength.
 - g) What is alloy ?
 - h) Define glass transition temperature.
 - i) Draw neat diagrams of BaTiO_2 crystal.
 - j) What do you know about CRSS ?
2. Attempt **any two** : **10**
- a) State different types of point defect. Explain Frenkel defect.
 - b) What is recovery and recrystallization ? Compare between them.
 - c) What is polymerization ? Explain addition or chain polymerization.



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

a) A rod of copper should not be stressed more than 70 MPa(or N/m) in tension. What diameter required if it is to carry a load of 2000 kg ?

(Given $g = 9.8 \text{ m/S}^2$)

b) A FCC crystal has CRSS of 0.7 MN/m^2 what tensile stress must be applied along the [100] of the crystal to initiate plastic deformation ?

c) A syrup contains 67% sugar (33% water at 20°C but 83% sugar at 100°C). One hundred grams of sugar and 25 gm of water are mixed and boiled until all sugar is dissolved. During cooling solubility limit is exceeded. So that (with time) excess sugar separates from the syrup. If equilibrium is attained what is the weight ratio of syrup to sugar at 20°C ?

4. A) Attempt **any one** : 8

a) What is A-X structure ? Discuss AX structure of CsCl type and NaCl type.

b) Give the importance of phase diagram. Draw and explain the phase diagram for solubility of sugar in water.

B) Attempt **any one** : 2

a) Explain term vacancy

b) Define electrical conductivity.



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
CHEMISTRY (Paper – I)
CH-331 : Physical Chemistry
(2008 Pattern) (New Course)

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

1. Attempt the following : 10
- a) Explain the term 'Heterogeneous Reaction' with suitable example.
 - b) State reduced mass equation for diatomic molecule and explain the terms involved in it.
 - c) Sketch 110 plane in BCC crystal lattice.
 - d) Give any one example of adsorption of gases on liquids.
 - e) State the equation for velocity constant of the second order reaction for unequal initial concentrations.
 - f) Why oxygen molecule is Raman active ?
 - g) What do you mean by van der Waals' adsorption ?
 - h) Define 'Refractive Index'.
 - i) If the velocity constant is $1.33 \times 10^{-5} \text{ min}^{-1}$, calculate half life period of reaction.
 - j) Define plane of symmetry.
2. A) Attempt **any two** of the following : 6
- i) Explain pseudo molecular reaction with suitable examples.
 - ii) Explain how dipole moment is useful in the determination of percentage ionic character of the compound with suitable example.
 - iii) Give the characteristics of chemisorption.

P.T.O.



- B) Solve **any one** of the following : 4
- i) The inter planer spacing of a set of planes is 1.58 \AA . Calculate the wave length of beam of light used for first order diffraction by $23^{\circ}3'$.
 - ii) Calculate the molar refraction of acetone, if its refractive index is 1.36 and density is $0.7910 \text{ g per cm}^3$. (Mol. Wt. of acetone = 58.10)
3. Attempt **any two** of the following : 10
- i) Explain positions of sodium and chloride ions in NaCl lattice.
 - ii) What is fundamental vibrational frequency ? Derive an expression for transition from $V \rightarrow V + 1$ level in vibrational spectrum of a diatomic molecule.
 - iii) What is meant by chemical kinetics ? Explain the meaning of infinite reading and half life period of a reaction.
4. A) Give applications of adsorption with suitable example. 6

OR

- A) Attempt the following :
- i) Explain the mechanism of Raman effect with respect to polarizability and quantum theory.
 - ii) State assumptions of Langmuir adsorption isotherm.
- B) Solve **any one** of the following : 4
- i) Inversion of cane sugar into glucose and fructose in acid medium is first order reaction. It has a half life of 190 min. at 20° C . What fraction of cane sugar remains after 500 minutes ?
 - ii) If bond length of $^{12}\text{C}^{16}\text{O}$ is 1.31 \AA . Calculate moment of inertia and energy of CO in $J = 2$.



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Seat No.	
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T.Y.B.Sc. (Semester – III) Examination, 2012
CHEMISTRY (Paper – II)
CH-332 : Inorganic Chemistry
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**
2) Figures to the **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 : H = 1, B = 5, N = 7, O = 8 Fe = 26,
Co = 27, Ni = 28.

1. Answer the following : 10
- I) Give MO electron configuration for B_2 molecule.
 - II) What is the bond order of O_2^+ ion ?
 - III) Define, labile complexes.
 - IV) How many ionisable chloride ions are present in $[Co(NH_3)_5Cl]Cl_2$?
 - V) What type of isomerism is shown by $[Co(en)_3]^{3+}$ ion ?
 - VI) Define EAN rule.
 - VII) What is the hybridisation of $[NiCl_4]^{2-}$ ion ?
 - VIII) How many electrons are present in t_{2g} orbitals of Fe in $K_3[Fe(CN)_6]$?
 - IX) What is the magnetic moment of $[Ni(NH_3)_6]^{2+}$?
 - X) Which ligand group orbitals are involved in σ bonded octahedral complexes as per the MOT ?

P.T.O.



2. A) Answer **any two** of the following : 6
- I) Give postulates of C.F.T.
 - II) Discuss formation of NO molecule with the help of MOT.
 - III) Write a note on 'charge transfer spectra'.
- B) Answer **any two** of the following : 4
- I) Calculate the EAN in the following complexes.
 - a) $K_4[Fe(CN)_6]$ and b) $[Ni(CO)_4]$
 - II) Calculate the CFSE of $[CoF_6]^{3-}$ ion.
 - III) Distinguish between σ – MOs and π – MOs .
3. Answer **any two** of the following : 10
- I) Discuss the formation of N_2 and O_2 molecule on the basis of MOT.
 - II) Discuss π -bonding in octahedral complexes according to M.O.T.
 - III) For $[Co(NH_3)_6]^{3+}$ and $[CoF_6]^{3-}$, Do values are 23000 cm^{-1} and $13,000\text{ cm}^{-1}$ respectively. The pairing energy is $21,000\text{ cm}^{-1}$. Find number of unpaired electrons and magnetic moment in them.
4. A) Explain inner and outer orbital complexes with suitable examples. 6
- OR
- A) Answer the following : 6
- I) What type of isomerism is shown by following pair of complexes :
 - a) $[Co(NH_3)_3(NO_2)_3]$ and $[Co(NH_3)_6][Co(NO_2)_6]$
 - b) $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5SO_4]Cl$
 - c) $[Co(H_2O)_5ONO]$ and $[Co(H_2O)_5NO_2]$
 - II) Write note on : Nephel auxetic effect :
- B) Discuss the formation of HF molecule on the basis of MOT. 4
- OR
- B) Answer the following : 4
- I) Write the formulae of following complexes :
 - a) Potassium hexacyano ferrate (III)
 - b) Tetraaquo plumbate (II) ion.
 - II) Give the assumptions of Werner's theory.



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T.Y. B.Sc. (Semester – III) Examination, 2012
CHEMISTRY (Paper – IV)
CH-334 : Analytical Chemistry
(2008 Pattern) (New Course)

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 calculators is **allowed**.
4) **Neat** diagram must be drawn **wherever** necessary.

1. Answer the following : 10
- 1) Draw the structure of cupferron.
 - 2) Define the term bathochromic shift.
 - 3) What is thermogravimetric analysis ?
 - 4) Define the term sensitivity in AAS.
 - 5) What is the role of monochromator in AAS.
 - 6) Explain the principle of flame photometry.
 - 7) Mention different types of fuel used in FES.
 - 8) What is the principle of nephelometry ?
 - 9) What is decomposition potential ?
 - 10) State Ohm's law.
2. a) Answer **any two** of the following : 6
- 1) Give uses and care of electrodes in electrogravimetry.
 - 2) What are filters in colorimetry ? Explain its types.
 - 3) Discuss the determination of molecular weight of high polymer by using turbidimetry.

P.T.O.



- b) Answer **any two** of the following : 4
- 1) What is coprecipitation ? Explain with suitable examples.
 - 2) What current strength in ampere is required to liberate 10 g. of iodine from KI solution in 120 min. (Electrochemical equivalent of iodine = 1.32×10^{-3}).
 - 3) A transmittance of 3×10^{-2} M solution was found to be 65% at 420 nm. when placed in a cell of 1.5 cm path length. Calculate molar absorptivity.
3. Answer **any two** of the following : 10
- 1) What are organic precipitants ? Explain use of DMG and 8 hydroxy quinoline in precipitation.
 - 2) Give construction and working of total consumption burner and premix burner used in AAS.
 - 3) What are interferences in flame photometry ? How are they eliminated ?
4. a) What are the conditions for good precipitation in gravimetric analysis ? 6
- OR
- a) 1) What are light filters ? Explain the absorption and interference filters. 3
- 2) Explain construction and working of turbidimeter. 3
- b) If a precipitate of PbSO_4 is washed with 300 ml of water. Calculate how many grams of precipitate lost during washing operation. 4
- Given : K_{sp} of $\text{PbSO}_4 = 2.22 \times 10^{-6}$
Mol. wt of $\text{PbSO}_4 = 303$
- OR
- b) A solution of concentration 0.01 M. is placed in 3 cm path length cell shows an absorbance of 0.60. What will be the absorbance of solution if path length of cell reduces to half and concentration doubled ? 4
-



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
CHEMISTRY (Paper – V)
CH - 335 : Industrial Chemistry
(2008 Pattern) (New Course)

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 flowsheet wherever necessary.**

1. Answer the following : 10
- i) Define the term 'selectivity'.
 - ii) What is water gas ?
 - iii) What is complete fertilizer ?
 - iv) What is proof spirit ?
 - v) What is meant by carbonation ?
 - vi) Define the term incineration.
 - vii) Define the term process control.
 - viii) What is absolute alcohol ?
 - ix) Urea is a most popular nitrogenous fertilizer why ?
 - x) What is Lagoon ?
2. A) Attempt **any two** of the following : 6
- i) Differentiate between batch and continuous process.
 - ii) Distinguish between vanadium pentoxide and platinised asbestos catalyst used in manufacture of sulphuric acid.
 - iii) Write a short note on potassic fertilizer.

P.T.O.



- B) Answer **any two** of the following : **4**
- i) Give an importance of quality control in chemical process industry.
 - ii) Write a note on importance of waste management.
 - iii) What are safety measures that should be taken in chemical process industry ?
3. Answer **any two** of the following : **10**
- i) Describe two physical and two chemical methods of estimation of sugar.
 - ii) What is fermentation ? Discuss the conditions favourable for fermentation.
 - iii) Discuss the treatment and disposal of industrial waste.
4. A) Give an account of physico-chemical principles involved in manufacture of sulphuric acid by contact process. **6**
- OR
- A) What are fertilizers ? Discuss in detail the manufacture of urea with flow sheet diagram and chemical reactions involved.
- B) Write a short note on multiple effect evaporators. **4**
- OR
- B) Write a brief note on coffey still.



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**T.Y. B.Sc. (Semester – III) Examination, 2012
BOTANY (Paper – I) (New Course) (2008 Pattern)
BO-331 : Algae, Fungi and Bryophytes**

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) **All** questions are **compulsory**.
2) Draw **neat** labelled diagrams **wherever** necessary.
3) Figures to **right** indicate **full** marks.

1. Answer the following : 10
- Give any two general characters of Myxomycetes.
 - What is cryptoblast ?
 - Which type of rhizoid is present in Anthoceros ?
 - Name any two plants from chlorophyta.
 - Give any two uses of Saccharomyces.
 - Enlist any two characters of Hepaticopsida.
 - Give any two characters of Deuteromycetes.
 - Enlist the names of classes of Bryophyta as per the classification given by G. M. Smith (1955).
 - State any two general characters of Rhodophyta.
 - Give any two uses of Nostoc.
2. Attempt the following (**any two**) : 10
- Give general characters of Algae.
 - State the salient features of class Bryopsida.
 - Give general characters of Fungi.

P.T.O.



3. Write notes on **any two** : **10**
- a) General characters of class Ascomycetes.
 - b) Structure of thallus in Sargassum.
 - c) General characters of Bryophyta.
4. Sketch, label and describe five stages in the life cycle of Puccinia. **10**

OR

Describe the external morphology and internal structure of thallus of Marchantia.



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
ZOOLOGY (Paper – I)
ZY- 331 : General Zoology (2008 Pattern)
(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 :

- 1) State the food of Calotes. 10
- 2) What is mysis ?
- 3) Give names of the types of blood cells in Pila globossa.
- 4) Define nervous connective.
- 5) Give one example of hemichordata.
- 6) Define hibernation.
- 7) Define archinephros kidney.
- 8) State the names of any two accessory respiratory organs in fishes.
- 9) Name the organ of equilibrium in Pila, globossa.
- 10) State the function of pecten in Calotes versicolor.

P.T.O.



2. Attempt **any two** of the following : **10**
- i) Sketch and label the parts of pallial complex in pila.
 - ii) Describe different types of scutes in calotes.
 - iii) Describe the structure of heart in scoliodon.
3. Write short notes on **any two** of the following : **10**
- a) Dentition in mammals.
 - b) Torsion in Mollusca.
 - c) Food and feeding in calotes.
 - d) Shell of pila.
4. Describe digestive system of pila. **10**

OR

Describe male reproductive system of calotes.



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
ZOOLOGY (Paper – III)
ZY 333 : Biological Chemistry
(2008 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 coenzyme.
 - 2) Mention the biological significance of Na⁺ (sodium).
 - 3) What are cephalins ?
 - 4) What is oxidative rancidity ?
 - 5) Name the symmetric amino acid.
 - 6) Give the names of two aldose sugar.
 - 7) Define R_f value.
 - 8) Define acid.
 - 9) Define glycosidic linkage.
 - 10) What is active site of an enzyme ?
2. Attempt **any two** of the following : 10
- i) Explain reversible type of enzyme inhibition.
 - ii) What are amino acids ? Describe essential amino acid.
 - iii) Explain different types of fatty acids.

P.T.O.



3. Write notes on **any two** of the following : **10**
- a) Myocardial infarction
 - b) Primary structure of protein
 - c) Properties of enzymes
 - d) Henderson-Hasselbalch equation.
4. What are vitamins ? Describe water soluble vitamins with reference to their occurrence, biological functions and deficiency disorders. **10**

OR

What are carbohydrates ? Describe classification of carbohydrates with suitable examples.



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
ZOOLOGY (Paper – IV)
ZY-334 : Environmental Biology and Toxicology
(2008 Pattern) (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 **right** indicate **full** marks.

1. Attempt the following : 10
- 1) Define environment.
 - 2) What are producers ?
 - 3) Explain the term bioindicators.
 - 4) What is stratosphere ?
 - 5) What is LD50 ?
 - 6) What are abiotic components ?
 - 7) What are pollutants ?
 - 8) What is wild life ?
 - 9) What is acid rain ?
 - 10) Explain the term smog.
2. Attempt **any two** of the following : 10
- i) Explain effects of pesticides on human health.
 - ii) Describe green house effect.
 - iii) Give goals and objectives of environmental education.

P.T.O.



3. Write notes on **any two** of the following : **10**
- a) Significance of wild life conservation.
 - b) Renewable resources.
 - c) Biotic components.
 - d) Explain factors influencing toxicity.

4. What is pollution ? Write an account of sources and effects of water pollution. **10**

OR

4. What is eco system ? Describe in detail crop land eco system. **10**
-



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
GEOLOGY (Paper – II)
GL-332 : Igneous Petrology
(2008 Pattern) (New)

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) What are primary magmas ?
- b) Name any two volatiles present in the magma.
- c) Which rocks display vesicular structure ?
- d) Which minerals are usually found in the rock peridotite ?
- e) What is the basis for Shand's classification ?
- f) Define a Petrographic province.
- g) Which minerals give rise to a 'Corona' ?
- h) What is meant by a gravitational liquid separation ?
 - i) What is a sub-ophitic texture ?
 - j) When are granites developed ?

2. Answer the following (**any two**) :

- a) Significance of reaction series
- b) Crystallisation a ternary system
- c) Mixing of dissimilar magmas.

P.T.O.



3. Write notes on (**any two**) :

- a) Expansion cracks in igneous rocks
- b) Characteristics of a derivative magma
- c) Generation of magmas.

4. What is meant by crystal fractionation ? Describe Fo-Fa binary system.

OR

4. a) Significance of ropy and vesicular structures.
b) Shand's classification.
-



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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012
GEOLOGY (Paper – V)
GL-335 : Precambrian Stratigraphy of India
(2008 Pattern) (New)**

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) What are folded mountain belts ?
 - b) Define 'Transform faults'.
 - c) Give economic importance of Mansar Formation.
 - d) Explain the term 'Simplipal Volcanics'.
 - e) Name the craton in which Dongargarh Granite is found.
 - f) Give the structural trend of rocks of Dharwar Supergroup.
 - g) Name the Proterozoic basin in which Proterozoic rocks were deposited in Dharwar craton.
 - h) Give subdivisions of Delhi Supergroup.
 - i) Name the rock types of Sittampundi Complex.
 - j) Explain the term 'OMTG'.
2. Write notes on **any two** : **10**
- a) Earlier classification of Precambrian Formations.
 - b) Salkhala Group.
 - c) Stratigraphic succession of Cuddapah Supergroup.

P.T.O.



3. Write notes on **any two** : **10**
- a) Singhbhum Group.
 - b) Dongargarh Supergroup/Belt (stratigraphic succession)
 - c) Igneous rocks in Aravalli craton.
4. Give the geographic distribution, classification with stratigraphic succession, lithology and economic importance of Dharwar Supergroup OR Sakoli Group. **10**
-



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Seat No.	
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T.Y.B.Sc. (Semester – III) Examination, 2012
STATISTICS (Principal) (Paper – II)
ST 332 : Theory of Estimation
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions:** i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**
iii) **Use of scientific calculator and statistical tables is allowed.**
iv) **Symbols and abbreviations have their usual meaning.**

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

a) In each of the following cases choose the correct alternative : **(1 each)**

i) If \bar{X} is mean of random sample of size n from $N(\mu, \sigma^2)$ distribution (σ^2 known) then which of the following statement is not correct ?

- A) \bar{X} is m.l.e. of μ
- B) \bar{X} is moment estimator of μ
- C) \bar{X} is sufficient estimator of μ
- D) \bar{X} is not MVBUE of μ

ii) A random sample of size n is available from $U(0, \theta)$ distribution. M.L.E. of θ is

- A) \bar{X}
- B) $X_{(n)}$
- C) $X_{(1)}$
- D) $\frac{X_{(1)} + X_{(n)}}{2}$

P.T.O.



- iii) If \bar{X} is mean of random sample of size n from $P(m)$ distribution, then which of the following statements is correct ?
- A) $\frac{1}{\bar{X}}$ is unbiased and consistent estimator of $\frac{1}{M}$
- B) $\frac{1}{\bar{X}}$ is unbiased but not consistent estimator of $\frac{1}{M}$
- C) $\frac{1}{\bar{X}}$ is biased and consistent estimator of $\frac{1}{M}$
- D) $\frac{1}{\bar{X}}$ is biased and not consistent estimator of $\frac{1}{M}$
- iv) Pivotal quantity used for constructing confidence interval for parameter μ in case of $N(\mu, \sigma^2)$ distribution (σ^2 known) follows.
- A) Standard normal distribution
- B) t distribution
- C) Chi-square distribution
- D) F distribution
- b) In **each** of the following cases, state whether the given statement is **true** or **false** : **(1 each)**
- i) If T is sufficient estimator of parameter θ and ϕ is one to one and onto function then $\phi(T)$ is also sufficient estimator of θ .
- ii) If MVBUE exists, it is unique.
- c) i) Show that sample standard deviation is not an unbiased estimator of population standard deviation. **1**
- ii) State any one property of m.l.e. **1**
- d) Define the following terms : **(1 each)**
- i) Unbiased estimator
- ii) Pivotal quantity.



2. Attempt **any two** of the following : (5 each)

- a) State Neyman’s factorisation criterion for finding sufficient statistic for unknown parameter θ . Given a random sample of size n from Poisson distribution with parameter m , obtain sufficient statistic for m .
- b) Explain method of moments for estimation of parameters. A discrete random variable X has following p.m.f.

$$P(X = x) = \begin{cases} \binom{x+k-1}{x} p^k (1-p)^x & x = 0, 1, 2, \dots \\ 0 & \text{, otherwise} \end{cases} \quad , k > 0, 0 < p < 1$$

Find moment estimator of p if k is known.

- c) Define consistent estimator of parameter θ . X_1, X_2, \dots, X_n is a random sample from exponential distribution with p.d.f.

$$f(x; \theta) = \begin{cases} \frac{1}{\theta} e^{-\frac{x}{\theta}} & , x \geq 0, \theta > 0 \\ 0 & \text{, otherwise} \end{cases}$$

Show that sample mean \bar{X} is unbiased and consistent estimator of θ .

3. Attempt **any two** of the following : (5 each)

- a) Define Minimum Variance Unbiased Estimator (MVUE) of parameter θ . T_1 and T_2 are two independent unbiased estimators of parameter θ with variances σ_1^2 and σ_2^2 respectively. Determine the constants a_1 and a_2 such that $T = a_1 T_1 + a_2 T_2$ is unbiased estimator of θ with minimum variance.
- b) Define Fisher’s information function $I(\theta)$. Obtain $I(p)$ in case of $B(1, p)$ distribution.
- c) Explain the method of maximum likelihood for estimation of parameter. Obtain m.l.e. of parameter α if a random sample of size n is available from distribution of random variable X with p.d.f.

$$f(x; \alpha, \lambda) = \begin{cases} \frac{\alpha^\lambda e^{-\alpha x} x^{\lambda-1}}{\Gamma(\lambda)} & , x > 0, \alpha, \lambda > 0, \lambda \text{ known} \\ 0 & \text{, otherwise} \end{cases}$$



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

a) i) State and prove Cramer-Rao inequality. 7

ii) Obtain m.l.e. of parameter θ if a random sample of size n is available from distribution of random variable X with p.d.f.

$$f(x; \theta) = e^{-(x-\theta)}, x \geq \theta, \theta > 0$$

$$= 0, \text{ otherwise}$$

3

b) i) Define the term : confidence interval. Obtain $100(1 - \alpha)\%$ C.I. for σ^2 when a random sample of size n is drawn from $N(\mu, \sigma^2)$ distribution (μ known). 5

ii) X_1, X_2, X_3, X_4 and X_5 is a random sample from distribution with mean μ and variance σ^2 .

Let $T_1 = \frac{X_1 + X_2 + X_3 + X_4 + X_5}{5}$ and $T_2 = \frac{X_1 + X_2}{4} + \frac{X_3}{2}$. Show that T_1 and T_2 are unbiased estimators of μ . Obtain efficiency of T_1 with respect to T_2 . 5



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
STATISTICS (Principal) (Paper – IV)
ST-334 : Design of Experiments
(2008 Pattern)

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 abbreviation have their usual meaning.**

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

a) Choose the correct alternative in **each** of the following : **(1 each)**

i) In case of CRD with n_i observations on i^{th} treatment, $\sum_{i=1}^+ n_i = n$ and with

mathematical model $X_{ij} = \mu + \alpha_i + G_j$, the estimator of α_i is given by

- A) \bar{X}_i B) $n_i \bar{X}_i$ C) $n \bar{X}_i$ D) $\bar{X}_i - \bar{X}$

ii) Which of the following leads to reduction of experimental error

- A) Randomisation
B) Uniformity trials
C) Randomisation and local control
D) Replication and local control

iii) In 2^2 factorial experiment, expression for main effect A can be obtained by using

- A) $\frac{1}{2}(a + 1)(b + 1)$ B) $\frac{1}{2}(a - 1)(b + 1)$
C) $\frac{1}{2}(a + 1)(b - 1)$ D) $\frac{1}{2}(a - 1)(b - 1)$

iv) In case of 4×4 LSD, error degrees of freedom are

- A) 3 B) 6 C) 9 D) 15

P.T.O.



b) In each of the following cases, state whether the given statement is **true (T)** or **false (F)** : **(1 each)**

i) In case of RBD with 5 treatments and 4 blocks, the degrees of freedom for total S.S. are 19.

ii) In partial confounding the same interaction effect is confounded in all replicates.

c) Define the following terms : **(1 each)**

i) Experimental unit

ii) Treatment.

d) i) State any one advantage of LSD **1**

ii) Define concomitant variable in ANOCOVA giving an example. **1**

2. Attempt **any two** of the following : **(5 each)**

a) Explain in brief, the principle of randomisation. How is it used in LSD ?

b) State the mathematical model for RBD, along with assumptions. Explain the notations used. Further show that in RBD mean sum of squares due to error is an unbiased estimator of error variance.

c) What is meant by confounding in factorial experiment ? Explain the concepts of total and partial confounding by giving an illustration of each.

3. Attempt **any two** of the following : **(5 each)**

a) Write a note on Kruskal Wallis H test.

b) What is analysis of covariance ? Give one real life situation where analysis of covariance is used. Also state the expressions for the least square estimators of the parameters involved in the mathematical model of ANOCOVA in R.B.D.



- c) Obtain efficiency of LSD over corresponding RBD when (i) rows are used as blocks and (ii) columns are used as blocks, from the following information of a 4×4 L.S.D.

Total S.S. = 1943

Row S.S. = 259

Column S.S. = 155

Treatment S.S. = 1372

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

- a) i) In case of 2^3 factorial experiment, obtain the expression for interaction ABC. 6
- ii) In case of RBD, explain the procedure of testing hypothesis of equality of two treatment means giving justification. 4
- b) i) Explain split plot design. Give layout and ANOVA table for split plot design. 6
- ii) State the mathematical model in ANOCOVA in CRD. Also state the expressions for estimators of different parameters. 4
-



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
STATISTICS (Principal) (Paper – V)
ST – 335 : C – Programming (Turbo C)
(2008 Pattern) (New Course)

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. Attempt **each** of the following :

- a) Choose the correct alternative in **each** of the following : **(1 each)**
- i) In C language, absolute value of x is represented by :
- A) abs(x) B) |x|
C) absolute x D) fabs (x)
- ii) The newline (\n) character is used to
- A) advance the output to the next line
B) insert symbols in the line
C) delete extra lines
D) to get a clear screen
- iii) Elements of an array occupy
- A) random memory locations
B) subsequent memory locations
C) no space in memory
D) varying length of memory locations for each element
- iv) Recursive call results when
- A) a function calls another function
B) a function is not called
C) a function calls itself
D) a function call is not needed

P.T.O.



- b) State whether each of the following given statement is **true** or **false**. (1 each)
- The function gets () can not be used to read a line of text containing white spaces.
 - The data type of an array is the data type of its elements.
- c) i) Explain syntax of for loop. 1
 ii) Write an expression in C for the following mathematical expression

$$2\sqrt{x} + e^x.$$

1

- d) i) Explain the use of size of () operator. Give one illustration.
 ii) What is a pointer ? How do you initialize a pointer ?

2. Attempt **any two** of the following : (5 each)

- Explain each of the following giving syntax and one illustration.
 - if - - - else
 - switch
- Write syntax of while and do - - - while control structures. Also give an illustration for each. Differentiate between while and do - - - while control structures.
- i) Write a C program to find maximum of three unequal numbers
 ii) Give syntax of a structure and a union. How does a structure differ from a union ?

3. Attempt **any two** of the following : (5 each)

- Write a C program to obtain median of n observations.
- Draw a flowchart to obtain correlation coefficient between two variables X and Y.
- Write a C program to find area of a triangle and a circle.

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

- Write a C program to fit Binomial distribution to the data given below : 10
 $x_i : 0 \quad 1 \quad 2 \quad 3 \quad 4$
 $f_i : 10 \quad 11 \quad 15 \quad 9 \quad 5$
- i) Write a C program to obtain mean and variance of n observations. Input the observations using an array. 5
 ii) Write a C program to obtain addition of two matrices, each matrix is of the order 3x3. 5



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
STATISTICS (Principal) (Paper – VI) (Ele. – I)
ST- 336 (A) : Operations Management
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

Instructions : 1) **All questions are compulsory.**

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

3) **Use of scientific calculators and statistical tables is allowed.**

4) **Symbols and abbreviations have their usual meaning.**

1. Attempt **each** of the following : **(1 each)**

a) In **each** of the following cases choose the correct alternative from the given alternatives.

i) The relationship between crash cost and crash time is

- A) Both increase simultaneously
- B) Both decrease simultaneously
- C) Crash time increases and crash cost decreases.
- D) Crash time decreases and crash cost increases

ii) The graph of average cost verses year in replacement model is

- A) U shaped
- B) Straight line
- C) Exponentially increasing
- D) Irregular shaped

iii) Coefficient of optimism (α) is always

- A) Less than '0'
- B) More than '1'
- C) Between 0 and 1
- D) Any real number

iv) Slack time is the difference between

- A) Earliest state time and earliest finish time
- B) Earliest start time and latest finish time
- C) Earliest start time and project duration
- D) Latest start time and earliest finish time

P.T.O.



- b) In **each** of the following cases state whether the given statement is **true** or **false**. **(1 each)**
- i) In CPM most likely time is the average of optimistic and pessimistic time.
 - ii) Hurvitz criterion is based on coefficient of optimism.
- c) Define **each** of the following terms : **(1 each)**
- i) EOQ
 - ii) Free float
- d) i) What is minimax criterion ? **(1 each)**
- ii) What is critical activity ?
2. Attempt **any two** of the following : **(5 each)**
- a) Write a short note on ABC analysis
 - b) A project consists of following activities and time estimates.

Activity	t_o	t_m	t_p
A	3	5	6
B	1	2	3
C	2	4	6
D	6	8	12
E	8	12	17
F	0	0	0
G	5	7	9
H	6	9	12
I	1	2	3
J	3	6	8
K	8	15	20
L	2	4	6

Precedence relationship is

A & B can start simultaneously.

C, D > A; E > B, C; F, H > E; G > D, F

J > G ; I, K > H; L > J, I

- i) Draw project network
- ii) Find the expected time of each activity



c) A fleet owner finds from his records that the costs per year of running a truck whose purchase price is Rs. 50,000/- are given below.

Year	Running Cost (Rs.)	Resale value (Rs.)
1	15,000	35,000
2	16,000	25,000
3	18,000	17,000
4	21,000	12,000
5	25,000	8,000
6	29,000	5,000
7	34,000	5,000
8	40,000	5,000

At what year is the truck due for replacement ?

3. Attempt **any two** of the following. **(5 each)**

- a) Derive an expression for economic lot size with uniform, rate of demand, instantaneous replenishment with shortages.
- b) The following data relates to a network

Activity	Duration (in days)
10 – 20	2
20 – 30	10
30 – 40	5
40 – 50	6
50 – 60	5
60 – 70	8
30 – 60	6
20 – 50	3
50 – 70	9

Calculate earliest and latest event times and hence determine the critical path. Also find the project duration.



c) The demand pattern of the cakes in a bakery is as follows :

No. of cakes demanded	:	0	1	2	3	4	5
Probability	:	0.05	0.10	0.25	0.30	0.20	0.10

If the preparation cost is Rs. 3/- per unit and selling price is Rs. 4/- per unit, how many cakes should the baker make to maximise his profit ?

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

a) i) State the difference between EMV and EVPI.

3

ii) The following table gives data related to a network.

Activity	Normal Time (Weeks)	Normal Cost (Rs.)	Crash Time (Weeks)	Crash Cost (Rs.)
10 – 20	16	7,000	14	9,000
10 – 30	14	8,000	12	10,000
20 – 40	18	6,000	16	7,000
30 – 40	16	10,000	14	11,000
40 – 50	12	12,000	12	12,000

Determine critical path and find normal project duration. Crash the relevant activities and determine optimal project duration, if indirect cost is Rs. 750/- per week.

b) i) A certain item costs Rs. 235 per ton. The monthly requirement is 5 tons and each time the stock is replenished, there is a set up cost of Rs. 1,000/-. The cost of carrying of inventory has been estimated as 10% of the value of stock per year. What is the optimum order quantity ?

4

ii) The following matrix gives the pay off of different strategies (alternatives) S_1, S_2, S_3 against conditions $N_1, N_2, N_3,$ and N_4 .

	N_1	N_2	N_3	N_4
S_1	4000	- 100	6000	18000
S_2	20000	5000	400	0
S_3	20000	15000	-2000	1000

Determining the optimal strategy using

i) Maximax

ii) Regret criterion.

6



Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
STATISTICS (Principal) (Paper – VI) (Ele. – I)
ST : 336 (B) : Actuarial Statistics
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- i) All questions are **compulsory**.*
 - ii) Figures to the **right** indicate **full** marks.*
 - iii) **Use** of scientific calculator and statistical tables is **allowed**.*
 - iv) Symbols and abbreviations have their **usual** meaning.*

1. a) In **each** of the following cases, choose correct alternative : **(1 each)**

i) If $s(x)$ is survival function of $T(x)$ then $s(0)$ is

- A) 0
- B) ∞
- C) 1
- D) $\frac{1}{2}$

ii) If δ is constant force of mortality then $\delta =$

- A) $-v$
- B) $\log v$
- C) v
- D) $-\log v$

iii) Loss at issue $l(t)$ is always following function

- A) constant
- B) increasing
- C) decreasing
- D) step



iv) Under the assumption of constant force of mortality μ and constant force of interest δ , $\bar{P}(\bar{A}_x)$ is

- A) δ
- B) $\frac{\mu}{\mu + \delta}$
- C) μ
- D) $\frac{1}{\mu + \delta}$

b) In **each** of the following cases, state whether the given statement is **true** or

false : **(1 each)**

- i) The relationship between A_x and \bar{A}_x is $\bar{A}_x = \frac{\delta}{i} A_x$.
- ii) $K(x)$ is a discrete random variable.

c) Explain **each** of the following terms : **(1 each)**

- i) Insured.
- ii) Speculative risk.

d) Give meaning of **each** of the following notation : **(1 each)**

- i) t/u^q_x
- ii) $A^{-1}_{x:\bar{n}}$

2. Attempt **any two** of the following : **(5 each)**

- a) i) Explain the role of an actuary in an Insurance Company.
- ii) State any three characteristics of insurable risk.



b) With effective rate of interest 8% per annum, obtain the following :

- i) Effective rate of discount
- ii) Accumulated value of Rs. 40,000 at the end of 4th year.
- iii) Present value of Rs. 10,000 due at the end of 3rd year.
- iv) Nominal rate of interest convertible six monthly.

c) A decision maker's utility function is given by $U(w) = \sqrt{w}$. The decision maker has wealth $w = 10$ units and faces a random loss X with a uniform distribution on $(0, 10)$. What is the maximum amount the decision maker has to pay for complete insurance against random loss ?

3. Attempt **any two** of the following : **(5 each)**

- a) Define survival function of time until death random variable (X). Also obtain probability density function $g(t)$ of the variable $T(x)$.
- b) The survival rates (p_x) for a population of certain animal are as follows :

Age (in months) (x)	0	1	2	3	4	5	6
p_x	0.8	0.75	0.7	0.4	0.2	0.1	0.0

For a radix of 1,00,000 obtain the columns l_x , L_x and T_x .

- c) Under the assumption of uniform distribution of deaths in unit interval of time, find
 - i) $\mu_{62.5}$ if $l_{61} = 4952, l_{62} = 4800, l_{63} = 4609$.
 - ii) $1.5P_{50}$ if $l_{50} = 9500, l_{51} = 9000, l_{52} = 8000$.



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

a) I) Obtain $E(z)$ where z is net single premium in terms of v for **5**

i) n year term insurance

ii) whole life insurance

iii) n year pure endowment insurance. **5**

II) If for the annuity certain, the payments are made regularly at the beginning of year in each year for a period of n years then show that

$$\ddot{S}_{\overline{n}|} = (1+i)^n \ddot{a}_{\overline{n}|}.$$

b) I) With usual notation, show that if $y = \bar{a}_{\overline{T}|}$ then distribution function of y

is given by $F_y(y) = P\left[y \leq -\frac{\log(1-\delta y)}{\delta}\right]$. **5**

II) For fully continuous whole life insurance of Re 1 on (x) , if premiums are

determined by equivalence principle and $\frac{\text{Var}(Z)}{\text{Var}(L)} = 0.36$ with $\bar{a}_x = 10$,

calculate $\bar{P}(\bar{A}_x)$ **5**



Seat No.	
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T.Y.B.Sc. (Semester – III) Examination, 2012)
STATISTICS (Principal) (Paper – VI) (Ele. – I)
ST-336 (C) : Time Series Analysis
(2008 Pattern) (New Course)

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 meanings.**

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

a) Choose the correct alternative, in **each** of the following : **(1 each)**

i) The data of time series should have time in

- A) Weeks
- B) Months
- C) Years
- D) Any unit of time

ii) $\frac{y^\lambda - 1}{\lambda}$, $\lambda \neq 1$ is referred as

- A) Fourier transformation
- B) Box-Cox transformation
- C) Power transformation
- D) Log transformation



iii) The multiplicative model of time series is

A) $T.S + C.I = Y_t$

B) $T + S.C + I = Y_t$

C) $\text{Log } Y_t = \text{Log } T + \text{Log } S + \text{Log } C + \text{Log } I$

D) $Y_t = T + S.C.I$

iv) For a series of 20 observations $\sigma_e^2 = 500$ under AR (2) model, residual sum of squares is

A) 1000

B) 9000

C) 9500

D) 25

b) State whether **each** of the following statement is **true** or **false** : (1 each)

i) Differencing is used to reduce stationary time series to non-stationary series.

ii) Method of selected points uses extreme observations.

c) Define : (1 each)

i) Irregular variation

ii) Exponential smoothing.

d) i) State AR (2) model. 1

ii) State use of Box-Cox transformation. 1



2. Attempt **any two** of the following : (5 each)

- a) Define moving average of length K. State merits and demerits of moving average technique.
- b) Explain in brief the utility of Box-Jenkin technique.
- c) Obtain the trend estimates using simple exponential smoothing method, with $\alpha = 0.25$, for the following series.

Year	:	2001	2002	2003	2004	2005	2006
Sales	:	120.6	116.4	138.3	131.4	128.2	119.4

(In lacs Rs.)

Obtain trend estimate for year 2012.

3. Attempt **any two** of the following : (5 each)

- a) Write a note on deseasonalisation of time series under multiplicative model.
- b) Explain in brief any one non-parametric test in analysis of time series.
- c) Given $n = 15$, $\sum t = 120$, $\sum t^2 = 1240$, $\sum t.y_t = 946.50$, $\sum y_t = 88.78$, $\sum y_t^2 = 610.35$. Fit a linear trend by method of least squares. Interpret the results obtained.

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

- a) i) State uses of auto correlation function. 4
- ii) Carry out 'Rule of thumb' procedure if sample auto correlation based on a sample of 50 is 0.8739. 6
- b) i) What are the different plots used in studying time series ? Explain in brief any one. 5
- ii) Explain in brief Durbin-Watson test. 5





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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
GEOGRAPHY – Paper – III
Gg – 333 : Fundamentals of Geoinformatics – Paper – I
(2008 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) Define GIS.
 - b) What is meant by aerial photography ?
 - c) Who coined the term GIS ?
 - d) Name any two components of GIS.
 - e) Define DTM.
 - f) Mention any two data sources in GIS.
 - g) Define DBMS (Data Base Management System).
 - h) What is non spatial data ?
 - i) What is vector data ?
 - j) Write any two characteristics of raster data.

P.T.O.



2. Write short answers (**any two**) : **10**

- a) Explain how aerial photographs are data source in GIS ?
- b) Explain Manipulation as a GIS task.
- c) Difference between spatial and non spatial data.

3. Write short notes (**any two**) : **10**

- a) Satellite images as a data source in GIS.
- b) DEM.
- c) Data types.

4. Explain how remote sensing and GIS are helpful in agriculture.

OR

Give the detailed account of data models. **10**



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Seat No.	
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T.Y.B.Sc. (Semester – III) Examination, 2012
GEOGRAPHY (Paper – VI)
Gg-336 : Fundamentals of Geoinformatics (Paper – II)
(2008 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 meant by Principal Point ?
 - b) Define Frequency.
 - c) Give any two keys of visual image interpretation.
 - d) Distinguish between emission and transmission.
 - e) Define air base.
 - f) What is meant by wave height ?
 - g) What is overlap ?
 - h) What is microwave region ?
 - i) Mention types of aerial cameras.
 - j) What do you meant by FCC (False Color Composite) ?

P.T.O.



2. Write short answers (**any two**) : **10**
- a) IR scanners
 - b) Types of scattering
 - c) Types of stereoscopes.
3. Write short notes (**any two**) : **10**
- a) IR black and white photographs
 - b) Visible spectrum
 - c) Pseudoscopic image.
4. Discuss various applications of aerial photographs in resource surveys.

OR

Describe geometry of an aerial photograph. **10**



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
MICROBIOLOGY (Paper – III)
MB-333 : Enzymology (New)
(2008 Pattern)

Time : 2 Hours

Total Marks : 40

- N.B. :** 1) **All questions are compulsory.**
2) **All questions carry equal marks.**
3) **Draw neat labeled diagrams wherever necessary.**

1. Attempt the following : 10

A) Match the following :

A

- i) NMR
- ii) Nicotinic acid
- iii) Manometry
- iv) Chymotrypsin
- v) Entrapment

B

- a) Decarboxylase
- b) Proteolytic modification
- c) Atomic structure
- d) Agarose
- e) NAD

B) State whether the statements are **True** or **False** :

- i) Allosteric enzymes show classical Michaelis Menten behaviour.
- ii) In competitive inhibition V_{max} increases.

C) Fill in the blanks :

- i) _____ is used as anion exchanger in ion exchange chromatography.
- ii) The proteins are least soluble at their _____ pH.

D) Define-Active site of an enzyme.

P.T.O.



2. Attempt **any two** of the following : **10**
- a) How is trapping of ES complex is used for mapping of the active site ?
 - b) Explain the role of metal ions as coenzymes.
 - c) Explain spectrophotometric method of an enzyme assay.
3. Attempt **any two** of the following : **10**
- a) Explain covalent modification in regulatory enzymes.
 - b) Describe the phenomenon of salt precipitation of proteins.
 - c) How molecular weight of protein is determined by SDS-PAGE ?
4. Attempt **any one** of the following : **10**
- a) Derive MM equation of initial velocity for competitive inhibition.
 - b) Describe various types of feed back inhibitions.
-



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Seat
No.

T.Y. B.Sc. (Semester – III) Examination, 2012
ELECTRONIC SCIENCE (Paper – I)
EL-331 : Advanced Digital System Design
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) **All questions are compulsory.**
ii) **Neat diagrams must be drawn wherever necessary.**
iii) **Figures to the right indicate full marks.**
iv) **Use of calculator is allowed.**

1. Answer **all** of the following :

- a) Define “Race”. 1
- b) What is state machine ? 1
- c) Write VHDL statement for the following boolean expression
$$z = \bar{a} \cdot \bar{c} \cdot \bar{e} + \bar{b} \cdot c \cdot \bar{d} + c \cdot d \cdot e.$$
 1
- d) “Implication graph is a state reduction technique” – Comment. 2
- e) Define stable total state. 1
- f) “Registered PAL’s are provided with output macro cells” – Comment. 2
- g) “The state assignments for asynchronous sequential circuits are made with the objective of logic reduction” – comment. 2
- h) For a given VHDL program, find the 4 errors – 2

ENTITY N – 1 IS

BEGIN

PORT (a, b, c : IN :

x, y, z : OUT BIT) ;

P.T.O.



```

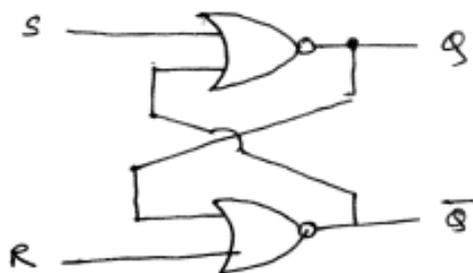
END N – 1;
ARCHITECTURE P – 1 of N – 1 IS;
BEGIN
x <= a AND b;
y <= NOT (a OR b OR c);
z <= NOT d OR a AND b OR c;
END P – 1;
    
```

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

- a) What is the use of merger graph ? Write the procedure to draw merger graph with the help of suitable incompletely specified state table. 4
- b) List the types of logic circuits. Draw the flowchart to indicate designing of digital system. 4
- c) Write various general designing steps for asynchronous sequential circuits. 4

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

- a) Write the expressions for next secondary state and output for a given logic circuit. Obtain next state table and transition table. 4



- b) What is programmable logic device ? State its advantages over fixed function IC's and ASIC. 4
- c) Write various basic symbols used in ASM diagram and explain each of them. 4



4. Answer **any two** of the following :

- a) With the help of block diagram, explain the working of Traffic Light Controller. 6
- b) State the three techniques used for making a critical race free state assignment for asynchronous sequential machine. Explain any one in detail. 6
- c) i) Explain GAL with block diagram
- ii) Compare synchronous and asynchronous sequential machines. 6

OR

4. Answer the following :

- a) Draw the diagram for PLA and specify its size for logical expressions of 3 – bit binary to gray code converter

$$G_0 = \bar{B}_1 B_0 + B_1 \bar{B}_0$$

$$G_1 = \bar{B}_2 B_1 + B_2 \bar{B}_1$$

$$G_2 = B_2$$

4

- b) Obtain reduced state table for the given state table using implication chart

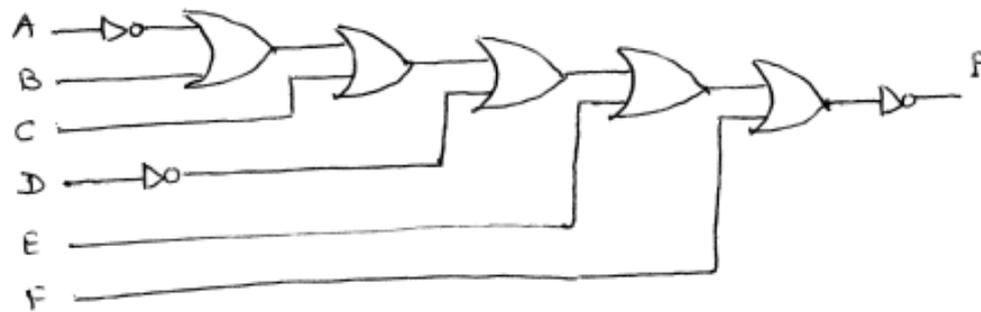
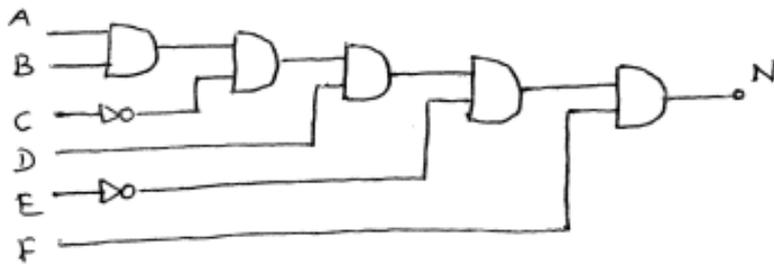
Present State	Next State Input, Output							
	00	z	01	z	11	z	10	z
A	B	0	C	0	B	1	A	0
B	E	0	C	0	B	1	D	1
C	A	0	B	0	C	1	D	1
D	C	0	D	0	A	1	B	0
E	C	0	C	0	C	1	E	0

4



c) Write VHDL program for given logic diagram.

4





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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
ELECTRONICS SCIENCE (Paper – II)
EL-332 : Microcontrollers (New)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) **Neat diagram must be drawn wherever necessary.**
 - 3) **Figures to *right* indicate *full* marks.**
 - 4) **Use of calculator is *allowed*.**

1. Answer **all** the following :

- a) What is simulator ? 1
- b) What is the function of the bits PSW.3 and PSW.4 ? 1
- c) Identify the mode of addressing in instruction `mov @R1, 88H`. 1
- d) If $A = 95$ and $R_2 = 05H$, what will be the content of A after execution of `ANL A, R2` ? 1
- e) What is difference between `RLA` and `RLC A` instruction ? 2
- f) Give size of RAM in μc 8051 and μc 8052 . 2
- g) What is the role of RS pin in LCD ? 2
- h) List the various SFR used in μc 8051 2

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

- a) Show the contents of PSW and register A after execution of following instruction.
`MOV A, # 0BFH`
`ADD A, # 1 BH.` 4
- b) Explain various addressing modes with proper example used in μc 8051 . 4
- c) Illustrate `DA A` instruction with suitable example. 4

P.T.O.



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

- a) Write a note on Assembler and Editor used for 8051 μc . 4
- b) Draw and explain port structure of port 0 of 8051 μc . 4
- c) Write a program to convert number 25 D in Hexadecimal form. 4

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

- a) Write a program to create a square waves of 50% duty cycle on P1.5 bit. Use timer 0 to generate time delay. 6
- b) Draw the block diagram to interface 4 \times 4 matrix key board using port 1 and port 2. Write major stages in key board interfacing. 6
- c) Interface 16k \times 8 ROM to 8051 μc , give its memory map. 6

OR

4. Answer **all** the following :

- a) Write a short note on interrupt structure of 8051 μc . 4
- b) Write a program for 8051 μc to place 55H in upper RAM locations from address 70H to 79H. 4
- c) Assume the five numbers are stored in memory location 40 to 44, write a program to add these numbers. Store higher byte of sum in R₇ and lower byte in accumulator. 4



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Seat
No.

T.Y. B.Sc. (Semester – III) Examination, 2012
ELECTRONIC SCIENCE (Paper – IV)
EL-334 : Foundations of Nanoelectronics
(2008 Pattern) (New Course)

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.

4) Log table/calculator is **allowed**.

Given : Mass of electron $m = 9.11 \times 10^{-31}$ kg.

Planck's constant $h = 6.625 \times 10^{-34}$ J.s.

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

- a) Write applications of nanotechnology. 1
- b) What is statistical mechanics ? 1
- c) Write the Schrodinger time independent equation. 1
- d) What is Fermi energy ? 1
- e) What is top down approach ? 2
- f) State Heisenberg uncertainty principle. 2
- g) What do you mean by quantum dot ? 2
- h) For a glass interface if $n_1=1$ and $n_2 = 1.5$ determine reflection coefficient. 2

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

- a) What do you mean by time scales of electrons in solids ? 4
- b) Describe elliptical polarization. 4
- c) Derive an equation of continuity. 4

P.T.O.



3. Attempt **any two** of the following :
- a) Write a note on wave particle duality. 4
 - b) Explain Bose Einstein probability distribution function. 4
 - c) Write Maxwell's equation in differential and integral form. 4
4. Attempt **any two** of the following :
- a) Explain the electron transport in quantum well. 6
 - b) What is Hall effect ? Obtain an expression for Hall voltage in semiconductor. 6
 - c) i) Using De.Broglie hypothesis. Show that $\lambda = \frac{h}{mV}$. 3
 - ii) Calculate the De Broglie wavelength of an electron moving with speed $\frac{1}{10}^{\text{th}}$ of the velocity of light. 3
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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – IX) (Elective – IV)
DS-339(A) : Defence Management in India (Optional)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences **each** : **16**
- 1) Write any two functions of Defence Management.
 - 2) Define Defence Management.
 - 3) What do you mean by procurement culture ?
 - 4) State the meaning of National Security.
 - 5) Define Leadership.
 - 6) Write the meaning of civil-defence.
 - 7) Write the meaning of war potential.
 - 8) What do you mean by political economy ?
2. Answer in **8 to 10** sentences **each (any two)** : **8**
- 1) Explain scope of Defence Management.
 - 2) Discuss role of leadership in Defence Management.
 - 3) Explain importance of team building in Armed Forces.
3. Write short notes on **(any two)** : **8**
- 1) Challenges to Defence Management.
 - 2) Principles of management.
 - 3) Organizational aspects of decision making.
4. Answer in **18 to 20** sentences **(any one)** : **8**
- 1) Discuss military concept on management.
 - 2) Explain defence management of India.

P.T.O.



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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – IX) (Elective – IV)
DS-339(B) : Internal Security of India – I (Optional)
(2008 Pattern)

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) Define “Human Security”.
 - 2) What do you mean India’s bottle neck ?
 - 3) State the meaning of “Agitation”.
 - 4) State any one example of SEZ affected State.
 - 5) What do you understand by Internal Security ?
 - 6) From which Indian State “Naxalism” problem was started ?
 - 7) State the meaning of seven sister.
 - 8) What do you understand by State ?
 2. Answer in **8** to **10** sentences (**any two**) : **8**
 - 1) Explain the political dimensions of internal security problem of India.
 - 2) Explain in brief the concept of “Internal Security”.
 - 3) Write in brief the concept of S.E.Z.
 3. Write short notes on (**any two**) : **8**
 - 1) Nature of Naxalite problem.
 - 2) Concept of human security.
 - 3) Economic dimension of India’s internal security problem.
 4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) Explain the possible threats to India’s internal security problem in the present context.
 - 2) Explain the nature of Kashmir problem as a internal security problem of India.
-



Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – IX) (Elective – IV)
DS-339(C) : India's Maritime Security – I (Optional)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences **each** : **16**
 - 1) State the meaning of Maritime Environment.
 - 2) Define Maritime Boundaries.
 - 3) Define Exclusive Economic Zone (EEZ).
 - 4) State the meaning of sea power.
 - 5) Define war potential.
 - 6) Write the meaning of freedom to use the sea.
 - 7) What do you mean by maritime resources?
 - 8) Write any two elements of sea power.

2. Answer in **8 to 10** sentences **each (any two)** : **8**
 - 1) Explain brief history of Ocean.
 - 2) Discuss concept of maritime boundaries.
 - 3) Explain Exclusive Economic Zone (EEZ).

3. Write short notes on **(any two)** : **8**
 - 1) Role of Naval bases in maritime security.
 - 2) Navigational aids.
 - 3) Role of coast guard.

4. Answer in **18 to 20** sentences **(any one)** : **8**
 - 1) Explain new challenges to Maritime security.
 - 2) Discuss India's maritime strategy.



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Seat No.	
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T.Y.B.Sc. (Semester – III) Examination, 2012
ENVIRONMENTAL SCIENCE (New Course) (Paper – II)
ENV 302 : Wildlife Biology
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions: 1) ***All questions are compulsory.***

2) ***Neat and labeled 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 Biodiversity Hot-spots ?
 - b) State any 2 characteristic difference between Millipedes and Centipedes.
 - c) Enumerate any 2 forest types.
 - d) What is meant by Habitat Fragmentation ?
 - e) What are Pteridophytes ?
 - f) What is meant by lentic ecosystem ? Give examples.
 - g) State any 2 characteristics of mammals.
 - h) What are pug marks ?
 - i) What are wetlands ?
 - j) Name any 2 flightless bird species.

P.T.O.



2. Write a short note on (**any two**) : **10**
- a) Quadrat method
 - b) Marine habitats
 - c) Conservation of genetic resources.
3. Answer **any two** from the following : **10**
- a) Explain with example, how developmental projects pose a threat to wildlife.
 - b) Discuss grassland as a wildlife habitat.
 - c) Discuss the use of GIS and remote sensing in wildlife management.
4. Attempt **any one** of the following : **10**
- a) Explain any 5 population assessment techniques for animals.
 - b) Discuss, with examples, the characteristics of 5 major groups of plants.
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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012
ENVIRONMENTAL SCIENCES (New Course)
ENV 334 : Issues in Environmental Sciences
(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**
2) **Neat and labelled 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 sustainable development.
 - b) Write full form of WTO.
 - c) Enlist any two environmental toxicants.
 - d) What is meant by green house effect.
 - e) Define the term biodiversity hot spots.
 - f) Give any two examples of GM plants.
 - g) Enlist any two causes of population explosion.
 - h) What is meant by eco-housing ?
 - i) What is non-renewable resource ?
 - j) What is meant by carbon sequestration ?
2. Write a short note on (**any two**) : **10**
- a) Eco-journalism.
 - b) Chemobyl disaster.
 - c) Rehabilitation of degraded land.

P.T.O.



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

- a) Explain role of NGO's in environmental conservation.
- b) Discuss in detail LCA method.
- c) Give an account on global environmental issues faced by mother earth.

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

- a) Explain methods of carbon sequestration and its benefits.
- b) Define ozone depletion. What are the causes and effects of ozone depletion ?



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
INDUSTRIAL CHEMISTRY
Industrial Methods of Chemical Analysis
Paper – V– (Vocational) (2008 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) State the difference between voltammetry and polarography.
 - b) What is the principle of hydrodynamic voltammetry ?
 - c) Define the term 'half-wave potential'.
 - d) What is an absorptive edge ?
 - e) State the principle of an X-ray fluorescence.
 - f) Give the sources of neutrons.
 - g) What is the temperature of hydrogen - air flame ?
 - h) Name the processes sequentially occurring in flame photometry.
 - i) Define base ion term used in mass spectrometry.
 - j) Give an example of polycrystalline ion-selective membrane electrode.
2. A) Answer **any two** of the following : 6
- a) Explain the role of supporting electrolyte in polarography.
 - b) Draw a neat labelled diagram of an X-ray absorption apparatus
 - c) What are the properties of ion-selective membranes ?
- B) Answer briefly **any two** of the following : 4
- a) How are thermal neutrons produced ? What is their energy ?
 - b) What are the limitations of AAS ?
 - c) State the advantages of DME.

P.T.O.



3. Answer the following (**any two**) : 10
- a) Explain with a neat labelled diagram, liquid membrane electrode.
 - b) A magnet has a field strength of 0.20 T. The radius of curvature of the ion path is 10.5 cm. Determine the accelerating potential required to direct a singly charged water molecule through an exit slit of the magnetic sector of this mass spectrometer.
 - c) The mass of 20 drops of mercury was found to be 0.1320 g and the drop time was 4.94 s. Calculate the flow rate of mercury from the capillary (mg/s).

4. A) With a neat labelled diagram, explain, how X-rays are generated in an X-ray tube. 6

OR

- A) Explain with a neat labelled diagram, a time of flight mass analyser in mass spectrometry.
- B) Answer the following (**any one**) : 4
- a) Derive Bragg's equation used in an X-ray diffraction technique.
 - b) State the principle of neutron diffraction analysis and give its applications.



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T.Y.B.Sc. (Semester – III) Examination, 2012
BIOTECHNOLOGY (Vocational)
Plant Biotechnology (Paper – V) (2008 Pattern)
(Voc.Biotech-335)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Black figures to the right indicate full marks.*
3) *Draw neat diagrams wherever necessary.*

1. Answer **each** of the following : **10**
- a) What is plant tissue culture ?
 - b) Give one cause of somaclonal variation.
 - c) Define somatic embryos.
 - d) Give difference between primary and secondary metabolites.
 - e) What is meant by haploid production ?
 - f) Enlist two physical methods of gene transfer in plants.
 - g) What is meant by germplasm ?
 - h) Give one example of medicinal plant.
 - i) What is bio farming ?
 - j) Give examples of two cytokinins.

P.T.O.



2. Answer **any two** of the following : **10**
- a) Discuss the causes of somaclonal variation.
 - b) Explain production of secondary metabolites.
 - c) Explain micropropagation of endangered species.
3. Write short notes on **any two** of the following : **10**
- a) Embryogenesis
 - b) GMO (Genetically Modified Plants)
 - c) Cryopreservation.
4. Define anther culture. Comment on uses of haploids. **10**
- OR
- Explain biological method of gene transfer in plants. **10**
-



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Seat
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
MATHEMATICS : Paper – III
MT-343 : Problem Course Based on MT-341 and MT-342
(2008 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 book.**
 - iv) **Tie answer books of both Sections together.**

SECTION – I
(Metric Spaces)

1. A) Attempt **any three** of the following :

6

i) Let $X = [0, 1]$ be a absolute value metric space.

Find $B\left(\frac{1}{4}, \frac{1}{2}\right)$ and $B\left(\frac{1}{2}, \frac{1}{4}\right)$.

ii) Give an example of metric space where every set is open as well as closed. Justify your answer.

iii) Define dense set. Find a subset D of \mathbb{R} such that D and its complement D' are both dense in \mathbb{R} .

iv) Is ellipse homeomorphic to a parabola ? Justify.

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

4

i) Show that every totally bounded set in any metric space is bounded.

ii) Show that \mathbb{R}^2 is a complete metric space.

P.T.O.



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

10

i) Let (X, d) be a metric space. Define $\delta(x, y) = \frac{d(x, y)}{1 + d(x, y)}$ for all $x, y \in X$.

Show that δ is a bounded metric space.

ii) If A is any finite set of metric space then show that $X - A$ is open.

iii) Show that any closed subset of compact metric space is compact and union of two compact sets is compact.

SECTION – II
(Complex Analysis)

3. A) Attempt **any three** of the following :

6

i) Show that $\exp\left(\frac{2 + \pi i}{4}\right) = \sqrt{\frac{e}{2}}(1 + i)$.

ii) Evaluate $\int_C \frac{1}{z} dz$, where C is the circle $|z| = 2$ in the positive sense.

iii) Show that $\operatorname{Res}_{z=-1} \frac{z^{1/4}}{z+1} = \frac{1+i}{\sqrt{2}}$ ($|z| > 0, 0 < \arg z < 2\pi$).

iv) Derive the expression : $\frac{\sin hz}{z^2} = \frac{1}{z} + \sum_{n=0}^{\infty} \frac{z^{2n+1}}{(2n+3)!}$ ($0 < |z| < \infty$).

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

4

i) Show that the function $u(x, y) = \frac{1}{2} \log(x^2 + y^2)$ is harmonic and find its harmonic conjugate.

ii) Evaluate $\int_C f(z) dz$, where $f(z) = \frac{z+2}{z}$ and C is the

a) semicircle $z = 2e^{i\theta}$ ($0 \leq \theta \leq \pi$)

b) semicircle $z = 2e^{i\theta}$ ($\pi \leq \theta \leq 2\pi$).



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

10

i) Using the definitions of sine and cosine functions of a complex variable z , prove that

$$\sin(z_1+z_2) = \sin z_1 \cos z_2 + \cos z_1 \sin z_2.$$

ii) Evaluate $\int_C \bar{z} dz$, where C is the right half of the circle $|z|=2$ from $z = -2i$ to $z = 2i$.

iii) Evaluate the integral $\int_C \frac{\cosh \pi z}{z(z^2 + 1)} dz$,

where C is the circle $|z| = 2$, described in the positive sense.



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
MATHEMATICS (Paper – IV)
MT – 344 : Ring Theory
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks :40

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

1. Attempt **any five** of the following : **10**

- i) Give an example of non- commutative ring that has exactly 16 elements.
- ii) Find all maximal ideals of Z_{12} .
- iii) Find all units in the ring of Gaussian integers $Z(i)$.
- iv) Show that $2Z \cup 3Z$ is not a subring of Z .
- v) Give an example of right ideal of a ring which is not a left ideal.
- vi) Find all solutions of the equation
$$x^2 + 2x + 4 = 0 \text{ in } Z_6.$$
- vii) Determine all homomorphisms from Z to Z .

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

- i) Prove that every finite integral domain is a field.
- ii) Let R be a commutative ring with unity. If M is prime ideal of R then show that R/M is an integral domain.
- iii) Show that an arbitrary intersection of left ideals of a ring R is a left ideal of the ring R .

P.T.O.



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

10

i) If D is an integral domain, then show that $D[x]$ is also an integral domain.

ii) Let $Z_3[i] = \{a + bi : a, b \in Z_3\}$. Then show that $Z_3[i]$ is isomorphic to

$$\frac{Z_3[x]}{\langle x^2 + 1 \rangle}$$

iii) Let F be a field, $f(x) \in F[x]$ and $a \in F$ be any element, then $(x - a)$ is a factor of $f(x)$ if and only if $f(a) = 0$.

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

10

i) a) Prove that ring of integers is a principal ideal ring.

b) Prove that if p is prime then

$$1 + x + x^2 + \dots + x^{p-1} \text{ is irreducible in } \mathbb{Q}.$$

ii) a) Prove that every Euclidean Domain is Principal Ideal Domain.

b) Show that $\phi : Z_4^+ \rightarrow Z_{10}$ is a homomorphism defined by $\phi(x) = 5x, \forall x \in Z_4^+$, also find Kernel of ϕ



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Seat
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
MATHEMATICS (Paper – V)
MT-345 : Partial Differential Equations
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following :

10

i) Show that $\frac{x dx - y dy}{x^2 + y^2} - 2z dz = 0$ is exact.

ii) Find integral curves of $\frac{dx}{y - z} = \frac{dy}{z - x} = \frac{dz}{x - y}$.

iii) Find solution of $(y + z) dx + (z + x) dy + (x + y) dz = 0$.

iv) Form the partial differential equation from $z = f(x^2 + y^2)$, where f is arbitrary function.

v) State the types of $(x^2 + y^2) p + xy q = x^2 + y^2 + z^2$. Also find its order.

vi) Find the complete integral of $pqz = p^2qx + pq^2y + p^2 + q^2$.

vii) Explain method of solving partial differential equation $f(p, q) = 0$.

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

10

i) Show that by elimination of arbitrary function F from $F(u(x, y, z), v(x, y, z)) = 0$ we get first order, Quasi-linear partial differential equation.

ii) Find integral curves of $\frac{dx}{xz - y} = \frac{dy}{yz - x} = \frac{dz}{1 - z^2}$.

iii) Find complete integral of $p^2x + qy - z = 0$.

P.T.O.



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

- i) Prove that a necessary and sufficient condition for the compatibility of $f(x, y, z, p, q) = 0$ and $g(x, y, z, p, q) = 0$ is

$$[f, g] \equiv \frac{\partial(f, g)}{\partial(x, p)} + p \frac{\partial(f, g)}{\partial(z, p)} + \frac{\partial(f, g)}{\partial(y, q)} + q \frac{\partial(f, g)}{\partial(z, q)}.$$

- ii) Find general integral of $(x^2 - y^2) p + 2xyq = (x + y) z$.
 iii) Find the integral surface of $(p^2 + q^2)x = pz$ passing through the curve $C : x_0 = 0, y_0 = s^2, z_0 = 2s$.

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

- i) a) Explain Jacobi's method of finding complete integral of partial differential equation

$$f(x, y, z, u_x, u_y, u_z) = 0$$

- b) Show that $(x - a)^2 + (y - b)^2 + z^2 = 1$ is a complete integral of $z^2(p^2 + q^2 + 1) = 1$.
 By taking $b = 2a$, show that the envelope of the sub-family is

$$(y - 2x)^2 + 5z^2 = 5.$$

- ii) a) Show that there always exist an integrating factor for a pfaffian differential equation in two variables.
 b) Find the integral surface of the equation $(2xy - 1) p + (z - 2x^2) q = 2(x - yz)$ which passes through the line $x_0 = 1, y_0 = 0, z_0 = 5$.



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Seat
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
MATHEMATICS (Paper – VII) (Ele – II)
MT – 347 (E) : Lebesgue Integration
(2008 Pattern)

Time : 2 Hours

Max. Marks :40

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

1. Attempt **any five** of the following : 10

i) True or False ? Justify.

If G is an open subset of $[a, b]$ and $|G| = 0$, then $G = \phi$.

ii) Find the outer and inner measure of $(0, 1]$.

iii) If f is a measurable function and $\lambda > 0$ is a real number, then prove that λf is measurable.

iv) Give an example of a set of measure zero. Justify your answer.

v) If $E \subseteq [a, b]$ prove that $\underline{m} E \leq \overline{m} E$.

vi) State Fatou's lemma.

vii) Show that $f(x) = 5 \quad \forall x \in [a, b]$ is a measurable function.

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

i) Let $E \subseteq [a, b]$. Prove that E is measurable if and only if $\overline{m} E + \overline{m} E' \leq b - a$.

ii) If f and g are measurable functions, then prove that $f + g$ is measurable.

iii) Find the Fourier series for

$$f(x) = 0 \quad -\pi \leq x < 0$$

$$= 1 \quad 0 \leq x \leq \pi$$

P.T.O.



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

10

- i) If $\{f_n\}_{n=1}^{\infty}$ is a sequence of measurable functions on $[a, b]$ such that the sequence $\{f_n(x)\}_{n=1}^{\infty}$ is bounded for every $x \in [a, b]$. Show that $\text{lub}_n \{f_n(x)\}$ and $\text{glb}_n \{f_n(x)\}$ are both measurable functions.
- ii) Show that $E \subset [a, b]$ is measurable if and only if given $\epsilon > 0$ there exist a closed set $F \subset E$ and an open set $G \supset E$ such that $|G| - |F| < \epsilon$.
- iii) Find f^+ and f^- if $f(x) = x^2 - 1$ for $-2 \leq x \leq 2$.

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

10

- i) a) If E_1, E_2, \dots are measurable subsets of $[a, b]$ and $E_1 \subset E_2 \subset \dots$ then prove that $\bigcup_{n=1}^{\infty} E_n$ is measurable and $m(\bigcup_{n=1}^{\infty} E_n) = \lim_{n \rightarrow \infty} m E_n$.

b) Evaluate $\int_0^1 \frac{1}{\sqrt[3]{x}} dx$.

- ii) a) Let $f \in L[a, b]$. Prove that given $\epsilon > 0 \exists \delta > 0$ such that $\left| \int_E f \right| < \epsilon$ whenever E is a measurable subset of $[a, b]$ with $mE < \delta$.

- b) Prove that the characteristic function of rationals ψ_θ is Lebesgue integrable on $[0, 1]$. Also evaluate $\int_0^1 \psi_\theta$.



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Seat
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
PHYSICS (Paper – II) (New) (2008 Pattern)
PH-342 : Quantum 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-table and calculator is allowed.**

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

- a) State de-Broglie hypothesis.
- b) What is a wave packet ?
- c) Define eigen value.
- d) State equation of continuity.
- e) What is tunneling effect ?
- f) What is the nature of energy spectrum of free particle ?
- g) What is rigid rotator ?
- h) Define degeneracy.
- i) Prove that $[\hat{A}, \hat{B}] = -[\hat{B}, \hat{A}]$.

j) If $H = \frac{P^2}{2m} + \frac{1}{2}mw^2x^2$, then show that ${}_xH - Hx = \frac{i\hbar}{m}P$.

2. Attempt **any two** of the following (**five marks each**) : **10**

- a) Prove that eigen values of Hermitian operator are real.
- b) Find the de-Broglie wavelength of neutron whose energy is 1 eV. Mass of neutron is 1.67×10^{-27} kg.
- c) The restoring force constant k for vibrations of the interatomic spacing of diatomic molecule is 10^3 J/m^3 . If mass of molecule is 4.9×10^{-26} kg, estimate the zero point energy of oscillator.

P.T.O.



3. Attempt **any two** of the following (**five marks each**) : **10**
- a) Prove that $[L^2, Lx] = 0$.
 - b) Show that particle in one-dimensional potential well will have discrete energy states.
 - c) Find the current density if wave function is $\psi(x) = A e^{ikx}$.
4. A) Attempt **any one** of the following (**eight marks each**) : **8**
- a) Using the Schrodinger's steady state equation, obtain eigen values of energy of particle in three dimensional rigid box.
 - b) Obtain Schrodinger's time dependent equation.
- B) Attempt **any one** of the following (**two marks each**) : **2**
- a) If $V_p = \sqrt{\frac{g\lambda}{2\pi}}$, determine group velocity.
 - b) State Ehrenfest's theorems.
-



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Seat
No.

T.Y. B.Sc. (Semester – IV) Examination 2012
PHYSICS (Paper – III)
PH-343 : Thermodynamics and Statistical Physics
(2008 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 calculator is allowed.**

1. Attempt **all** of the following (**one mark each**) : **10**
- a) Define 'mean free path' of the molecule of a gas.
 - b) Define probability.
 - c) What are Fermions ?
 - d) What is Joule-Thomson effect ?
 - e) What do you mean by 'Accessible macro states' ?
 - f) Define F-space (Gamma space).
 - g) What are anti-symmetric wave functions ?
 - h) What is most probable speed ?
 - i) State the postulate of 'equal a priori probabilities'.
 - j) Discuss the dependance of coefficient of thermal conductivity on temperature.
2. Attempt **any two** :
- a) Derive an expression for the coefficient of viscosity (η) of a gas in terms of mean free path of molecules. Show that it is independent of pressure but depends upon the temperature of the gas. **5**
 - b) For canonical ensemble, obtain the expression for mean energy (\bar{E}) and mean square energy (\bar{E}^2) in terms of β and Z . **5**
 - c) In case of B.E. statistics, prove that **5**

$$\bar{\eta}_r = \frac{1}{e^{\beta(\epsilon_r - \mu)}}$$

where symbols have their usual meanings.

P.T.O.

3. Attempt **any two** :

- a) If the coefficient of thermal conductivity of nitrogen is $4.25 \times 10^{-3} \text{ J/m sk}$ and the molar specific heat at constant volume is $25.6 \times 10^3 \text{ J/mole.k}$. Calculate coefficient of viscosity of nitrogen. 5
- b) Using Maxwell's law of distribution of molecular speed

$$dN = 4\pi N \left(\frac{m}{2\pi kT} \right)^{\frac{3}{2}} e^{-\frac{mv^2}{2kT}} \cdot v^2 dv .$$

Prove that most probable speed is given by $v_p = \sqrt{\frac{2kT}{m}}$ where symbols have their usual meanings. 5

- c) What is the probability of drawing four kings in succession from a pack of 52 cards ? 5

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

- a) Explain the thermodynamic potentials UHF and G. Hence obtain any two Maxwell's thermodynamic relations. 8
- b) Derive Gaussian probability distribution in the form of

$$P(x) dx = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-(x-\mu)^2/2\sigma^2}$$

and draw its probability distribution curve. 8

B) Attempt **any one** :

- a) Calculate the mean free path of a gas molecule of diameter $3.5 \times 10^{-10} \text{ m}$. The number of molecules per unit volume is $2.7 \times 10^{25} \text{ m}^{-3}$. 2
- b) When we throw a die twice and obtain two numbers. What is the probability that these numbers are 4 and 2 precisely in that order ? 2



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Seat
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
PHYSICS (Paper – V)
PH-345 (A) : Electronics (2008 Pattern) (New)

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 (**one mark each**) : **10**
- a) State the materials used for LED.
 - b) Define duty cycle and conduction angle.
 - c) Draw the symbol of N-channel JFET and MOSFET.
 - d) When a change in V_{GS} of a JFET is 0.1 V and change in drain current is 0.3 MA, find the value of transconductance.
 - e) Define Trip point.
 - f) State any four parameters of an ideal Op-amp.
 - g) Find the output pulse width of monostable multivibrator for $R_A = 20K\Omega$ and $C = 0.1\mu F$.
 - h) State any two features of IC 78XX.
 - i) What do you mean by Karnaugh map ?
 - j) Draw the logic diagram of R-S flip-flop with NAND gates.
2. Attempt **any two** :
- a) Explain the construction of n-channel MOSFET. Draw its transfer characteristic curves. **5**
 - b) Explain the action of an Op-amp as an integrator, derive the necessary formula for output. **5**
 - c) Explain basic low voltage regulator using IC 723. Draw the suitable circuit diagram. Explain designing of low voltage regulator. **5**

P.T.O.

3. Attempt **any two** :

- a) Find the duty cycle of astable multivibrator using IC 555 when $R_A = R_B = R$. **5**
- b) A 5-bit asynchronous counter begins with 00000 state. What will be the state of a counter after 80 input pulses ? **5**
- c) What is multiplexer and demultiplexer ? Draw circuit diagram for 4 : 1 multiplexer. **5**

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

- a) What is a register ? State four possible modes of operation. Draw the block diagram of IC 7490 and explain its use as decade counter. **8**
- b) What is Op-Amp ? Draw the symbol. Define CMRR. Determine the value of CMRR in dB, if differential voltage gain is 200 and common mode voltage gain is 0.5. **8**

B) Attempt **any one** :

- a) State any four advantages of LED. **2**
 - b) Draw the diagram of J-K Flip-Flop. **2**
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T.Y.B.Sc. (Semester – IV) Examination, 2012
PHYSICS (Paper – V)
PH-345 (B) : Advanced Electronics (2008 Pattern) (New)

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.**
iv) **Use of log tables and calculators is allowed.**

1. Attempt **all** of the following (**one mark each**) :
 - a) What do you mean by monochromatic and coherent sources of light ?
 - b) Explain need of signal conditioning.
 - c) State principle of photoconductive detector.
 - d) State types of accelerometers.
 - e) State types of thermistors which are used commonly as sensors.
 - f) State favourable conditions for using on-off control action.
 - g) What is linearization of signal ?
 - h) State principle of RTD (resistance temperature detector)
 - i) State working principle of Bimetal strip thermal sensor.
 - j) Draw Thevenin equivalent for photovoltaic cell.

2. Attempt **any two** of the following (**5 marks each**):
 - a) Write short note on light sources.
 - b) Explain effect of loading effect on the output of process variable.
 - c) A measurement signal frequency is less than 1000 Hz but there is an unwanted noise at about 100 kHz. Design a RC low pass filter that attenuates noise to 10% if capacitor used has value of 0.1 μF .



3. Attempt **any two** of the following (5 marks **each**) :
- a) Draw block diagram of water treatment plant and explain function of each block in brief.
 - b) Explain vapour pressure thermometer.
 - c) Explain types of motion and accelerometer principle.
4. A) Attempt **any one** of the following (8 marks **each**):
- a) What is pyrometry ? State types of pyrometers and explain any one type in brief.
 - b) Draw block diagram of DAS. Explain DAS hardware.
- B) Attempt **any one** of the following (2 marks **each**):
- a) Draw block diagram of simple process control loop.
 - b) Explain resistance versus temperature approximation in sensors.



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Seat
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
PHYSICS (Paper – VI (A)) (Elective – II)
PH-346 : Electro Acoustics and Entertainment Electronics
(2008 Pattern) (New)

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 calculators is allowed.***

1. Attempt **all** of the following (**one** mark **each**) : **10**
- a) Sketch intensity level versus frequency curves representing threshold of audibility and threshold of feeling.
 - b) Give the place theory of hearing.
 - c) Draw a diagram showing construction of condenser microphone. Give its equivalent circuit.
 - d) What is meant by dynamic range ?
 - e) What is volume compressor ?
 - f) Define directivity factor for a microphone.
 - g) What do you mean by articulation score ?

P.T.O.



- h) What is folded horn ?
- i) Give typical frequency response of a carbon microphone.
- j) Write a short note on equalizer.

2. Attempt **any two** :

- a) What do you mean by 'open circuit voltage response' of a microphone ? Explain the relationship between 'open circuit voltage response' and 'decibel response'. **5**
- b) Write a note on Digital Audio Tape (DAT). **5**
- c) Distinguish between monophonic and stereophonic sound reproducing systems. **5**

3. Attempt **any two** :

- a) Determine the cut-off frequency of an exponential horn having a flare constant of 4.9 on being used out doors at a temperature of 40° C. **5**
- b) Find the reverberation time of an office which has a volume of 1600 m³ and a total sound absorption of 100 metric sabines. What sound absorption will be required for an optimum reverberation time of 1.2 sec. ? **5**
- c) A condenser microphone diaphragm of radius 0.01 m is stretched to a tension of 2×10^4 N/m. If the spacing between the diaphragm and the backing plate is 4×10^{-5} m, determine the open circuit voltage response for a polarizing voltage of 250 V. **5**



4 A) Attempt **any one** :

a) Discuss acoustics of hearing mechanism in humans. **8**

b) Explain working of monophonic magnetic tape recording and reproducing system using a block diagram. **8**

B) Attempt **any one** :

a) Distinguish between a volume compressor and a volume limiter. **2**

b) Sketch the super cardioid and hyper-cardioid polar response of microphones. **2**



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T.Y. B.Sc. (Semester – IV) Examination, 2012
PHYSICS (Paper – VI (B))
PH-346 : Renewable Energy Sources (Ele – II)
(2008 Pattern)

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 (**one mark each**) : **10**
- a) What are non-conventional sources of energy ?
 - b) Define solar constant.
 - c) What is tidal energy ?
 - d) What is meant by OTEC ?
 - e) What are disadvantages of fixed dome type plant ?
 - f) Write the advantages of wind energy.
 - g) State the application of solar air heater.
 - h) What is meant by Zenith ?
 - i) Define solar collector.
 - j) The radius of sun surface is 6.960×10^8 m and the mean earth-sun distance is 1.5×10^{11} m. Find angular divergence.
2. Attempt **any two** :
- a) Explain the term solar radiation at the earth surface. **5**
 - b) Describe the construction and working of liquid flat plate collectors. **5**
 - c) Calculate the fill factor (F.F.) of solar cell by using following data : **5**
- $V_{OC} = 600$ mV
 $J_L = 50$ mA
 $V_{mp} = 500$ mV
 $J_{mp} = 40$ mA



3. Attempt **any two** :
- a) Describe Box type solar cooker with neat diagram. 5
 - b) Write short note on Energy audit. 5
 - c) Explain the applications of the Gasifier. 5
- 4 A) Attempt **any one** :
- a) Explain the basic photo-voltaic system integrated with power grid. 8
 - b) What is gasifier ? Explain working of 'Downdraft gasifier'. 8
- B) Attempt **any one** :
- a) Draw a neat diagram of structure of the sun. 2
 - b) A monoenergetic radiation beam having a wavelength of half a micrometer. Calculate the energy of a single photon. 2
- [Given : $h = 6.6256 \times 10^{-34}$ J.s., $C = 3 \times 10^8$ m/s.]
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**T.Y. B.Sc. (Semester – IV) Examination, 2012
PHYSICS (Paper – VI) (New) (2008 Pattern)
PH-346(C) : Elective – II : Physics of Nanomaterials**

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 (one mark each)** : **10**
- a) Name any one milestone in the development of nanotechnology.
 - b) Give an example of application of nanomaterials in sports.
 - c) What are aerogels ?
 - d) Name any one chemical method of synthesis of nanoparticles.
 - e) What is an exciton ?
 - f) Name any one important property shown by porous silicon.
 - g) What are different types of carbon nano tube ?
 - h) Which detectors are typically used in a UV-vis-NIR spectrometer ?
 - i) Write the expression for energy of a particle in 1-D box.
 - j) What is surface plasmon resonance ?
2. Attempt **any two** :
- a) Compare magnetic properties of bulk and nanomaterials. **5**
 - b) Write a note on application of nanomaterials in energy, space and defense. **5**
 - c) Explain :
 - i) atomic scattering factor
 - ii) crystal structure factor. **5**

3. Attempt **any two** :

a) Write short notes on the following synthesis methods :

i) high energy ball milling method

ii) sputtering method. 5b) State and explain Debye-Scherrer equation. What is its significance in the analysis of nanoparticles ? 5c) Draw a labeled diagram (Schematic) of a UV-vis-NIR spectrometer. 54 A) Attempt **any one** :a) Write a detailed note on electron microscopy. 8b) What happens to the melting point and mechanical properties of nanomaterials ? What is quantum size effect ? 8B) Attempt **any one** :a) Define : Nanoscience and Nanotechnology. 2b) Name any two parameters on which the properties of nanomaterials depend. 2



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**T.Y. B.Sc. (Semester – IV) Examination, 2012
PHYSICS (Paper – VI) (New) (2008 Pattern)
PH-346 : Elective – II-(D) : Lasers**

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) **All** questions are **compulsory**.
2) Figures to **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 are different types of lasers ?
 - b) What do you mean by metastable state ?
 - c) Why a pair of mirror is needed in optical oscillator ?
 - d) Define critical population inversion.
 - e) What is Doppler broadening ?
 - f) What is difference between normal light and laser light ?
 - g) Give two applications of laser in medicine.
 - h) Define threshold gain.
 - i) What is holography ?
 - j) What is nature of output of He-Ne laser ?
2. Attempt **any two** of the following :
- a) What is pumping ? Describe three level pumping scheme. **5**
 - b) Explain the action of optical resonator in laser. **5**
 - c) What are different characteristics of laser ? **5**



3. Attempt **any two** of the following :
- a) Find the relative population of the two states in Ruby laser that produces a light beam of wavelength 6943 \AA at 300 K and 500 K. 5
 - b) The He-Ne system is capable of lasing at several different IR wavelengths. The prominent one being 3.3913 mm . Determine the energy difference in eV between the upper and lower levels for this wavelength. 5
 - c) Write working of CO_2 laser. 5
- 4 A) Attempt **any one** of the following :
- a) What is solid-state lasers ? Describe the construction and working of Ruby laser. 8
 - b) What is line shape broadening ? Explain different types of line-shape broadening. 8
- B) Attempt **any one** of the following :
- a) A pulsed Ruby laser contains $4 \times 10^9 \text{ Cr}^{3+}$ ions. The wavelength of light emitted by laser is 6943 \AA . Find the energy of one emitted photon. 2
 - b) What is spontaneous emission ? 2
-



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**T.Y. B.Sc. (Semester – IV) Examination, 2012
PHYSICS (Paper – VI) (New) (2008 Pattern)
PH-346 : Elective – II(E) : Microcontrollers**

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 (1 mark each) : **10**
- a) What is the on-chip RAM space in 8051 ? What are the addresses allotted to it ?
 - b) Explain the instruction SWAPA in 8051.
 - c) Enlist features of 8051.
 - d) Explain the pin-function of TxD in 8051.
 - e) Convert hex number (7FFFH) into decimal.
 - f) How (-55) is stored in 8051 ?
 - g) What is PSW register in 8051 ?
 - h) Explain any one instruction in 8051 performing a bit-operation.
 - i) How LJMP differs from SJMP ?
 - j) Where the return address is stored for executing the RET instruction ?
2. Attempt **any two** of the following :
- a) Compare parallel data transfer with serial data transfer. **5**
 - b) Enlist various addressing modes in 8051. Give one example of each. **5**
 - c) What are different groups (functional) of 8051 instructions ? Give one example of each. **5**



3. Attempt **any two** of the following :
- a) Write an assembly language program for finding the smallest number from the given set (an array) of numbers. 5
 - b) Write an assembly language program for adding two 16-bit numbers 3377H and 6622H, store the result in R0 and R1 registers. 5
 - c) With help of diagram explain how 16×2 LCD is interfaced to 8051, explain in brief. 5
- 4 A) Attempt **any one** of the following :
- a) Draw the block diagram of 8051 microcontroller, explain each block in brief. 8
 - b) Explain the role of TMOD and TCON registers in operation of TIMER/COUNTER in 8051. 8
- B) Attempt **any one** of the following :
- a) Explain the instruction DA decimal adjust accumulator for addition with example. 2
 - b) What is the stack ? How it is used in calling the subroutines ? 2
-



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
BOTANY
Paper – I : BO-341 : Plant Physiology and Biochemistry
(New Course) (2008 Pattern)

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) Define cyclic photophosphorylation.
 - b) What is an aerobic respiration ?
 - c) Define translocation of organic solutes.
 - d) Mention types of seed dormancy.
 - e) What are abiotic stresses ?
 - f) State second law of thermodynamics.
 - g) Define proteins.
 - h) Give any two examples of secondary metabolites.
 - i) Define simple lipids.
 - j) What are enzymes ?
2. Attempt **any two** of the following : 10
- a) Distinguish between photosynthesis and respiration.
 - b) Explain various reactions of glycolysis.
 - c) Explain synthesis of amino acids by reductive amination.

P.T.O.



3. Write notes on (**any two**) : **10**
- a) Causes of seed dormancy.
 - b) Factors affecting enzyme activity.
 - c) Properties of lipids.
4. What is photosynthesis ? Describe an ultra-structure of a chloroplast. Add a note on accessory pigments and their role. **10**

OR

What are carbohydrates ? Give their classification and add a note on properties of monosaccharides. **10**



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T.Y.B.Sc. (Semester – IV) Examination, 2012
BOTANY (Paper – II)
BO-342 : Plant Pathology (New)
(2008 Pattern)

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) Define host.
 - b) What is pathology ?
 - c) Define epidemiology.
 - d) Give the name of causal organism of tikka disease of groundnut.
 - e) Give any two symptoms of ear cockle of wheat.
 - f) What is resistance ?
 - g) Give any two features of ICRISAT.
 - h) Cite the name of any two diseases caused by viruses.
 - i) Give any two control measures for little leaf of brinjal.
 - j) Define inoculation.
2. Attempt **any two** of the following : 10
- a) Give an account of IARI.
 - b) Describe biological control.
 - c) Give symptoms and control measures of root knot disease of vegetables.

P.T.O.



3. Write notes on **any two** of the following : **10**
- a) Disease forecasting.
 - b) Contribution of Prof. B.B. Mundkur.
 - c) Macro and microscopic study of plant diseases.
4. What is defence mechanism ? Describe structural and biochemical types of defence mechanism. **10**

OR

Give an account of citrus canker and downy mildew of grapes with reference to causal organism, symptoms and control measures. **10**



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T.Y. B.Sc. (Semester – IV) Examination, 2012
BOTANY (Paper – III)
BO-343 : Pteridophytes, Gymnosperms and Palaeobotany
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** i) **All questions are compulsory.**
ii) **Neat diagrams must be drawn wherever necessary.**
iii) **Figures to the right indicate full marks.**

1. Answer the following : 10
- a) What are Gymnosperms ?
 - b) Write any two salient features of pentoxylae.
 - c) Which era is considered as the age of Gymnosperms ?
 - d) Define fossil.
 - e) Write any two salient features of Psilopsida.
 - f) What is heterospory ?
 - g) Name the classes of Gymnosperm as per Chamberlain's classification (1934).
 - h) Write any two salient features of Pteridosperms.
 - i) Give any two general characters of Pteridophyta
 - j) Define pycnoxylic wood.
2. Attempt **any two** of the following : 10
- a) Comment on external and internal morphology of Stigmaria.
 - b) Describe male cone of Gnetum.
 - c) Describe T.S. of Equisetum stem.

P.T.O.



3. Write short notes on (**any two**) : **10**
- a) Impression.
 - b) External morphology of Selaginella.
 - c) Ovule of Cycas.
4. Describe the external and internal morphology of Pinus needle and comment on its xerophytic characters. **10**

OR

Sketch, label and describe external and internal structure of Marsilea sporocarp. **10**



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T.Y. B.Sc. (Semester – IV) Examination, 2012
ZOOLOGY (Paper – II) (2008 Pattern)
ZY-342 : Mammalian Physiology and Endocrinology (New)

Time : 2 Hours

Max. Marks : 40

- N.B.:** i) **All questions are compulsory.**
ii) **Neat and labelled diagrams must be drawn wherever necessary.**
iii) **Figures to the right indicate full marks.**

1. Attempt the following : 10
- 1) What is nutrition ?
 - 2) Define synapse.
 - 3) What is implantation ?
 - 4) Define feed-back mechanism of hormone action.
 - 5) Explain deamination.
 - 6) What is neurone ?
 - 7) What is apnoea ?
 - 8) Define glycolysis.
 - 9) What is passive transport ?
 - 10) What is lactation ?
2. Attempt **any two** of the following : 10
- i) Describe Respiratory Quotient (RQ).
 - ii) Explain saltatory conduction.
 - iii) Explain the hormonal control of male reproduction.
3. Write notes on **any two** of the following : 10
- a) Cardiac output
 - b) Simple muscle twitch
 - c) Hormones of thyroid gland
 - d) Oestrous cycle.
4. Describe in detail physiology of digestion. 10
- OR
- What is excretion ? Describe in detail physiology of urine formation. 10
-



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Seat No.	
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T.Y. B.sc. (Semester – IV) Examination, 2012
ZOOLOGY (Paper – VI)
ZY-346 : Genetics and Developmental Biology
(2008 Pattern) (New)

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
- i) What are somatic mutations ?
 - ii) Define genetic engineering.
 - iii) Define recon.
 - iv) Explain chimera.
 - v) Define inbreeding.
 - vi) State the law of Hardy-Weinberg.
 - vii) What is monospermy ?
 - viii) Define blastula.
 - ix) What is homozygous condition ?
 - x) Define telodecithal egg.
2. Attempt **any two** of the following : 10
- 1) Explain fast block reaction in fertilization.
 - 2) What are morphogenetic movements ?
 - 3) Explain cytoplasmic inheritance in shell coiling of *Lymnaea*.

P.T.O.



3. Write notes on **any two** : **10**
- 1) Ultra structure of spermatozoa.
 - 2) Spontaneous and induced mutation with example.
 - 3) The use of any two enzymes in genetic engineering.
 - 4) Regeneration in Hydra.
4. Describe the development of chick embryo up to 48 hours. **10**

OR

What is hybrid vigour ? Explain its significance with suitable example. **10**



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T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOLOGY (Paper – IV)
GL : 344 : Geotectonics
(2008 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 in **2/3** lines : **10**
 - a) Give the average density of earth.
 - b) Define the term plate margin.
 - c) Define the term subduction zone.
 - d) Define cyclone.
 - e) Define mountain system.
 - f) Define auroras.
 - g) Define TRM.
 - h) Define magnetic meridian.
 - i) What is back arc basin ?
 - j) Name the type of collision which generated Himalayan mountain.

2. Write notes on (**any two**) : **10**
 - a) Orogenesis and Epeirogenesis
 - b) Causes of earth's magnetic field
 - c) Hot plume and hot spot.

P.T.O.



3. Write notes on **(any two)** : **10**
- a) Fault block mountain
 - b) Divergent plate boundary
 - c) Effects of magnetic reversal.

4. Give the assumptions and problems regarding plate tectonic theory. **10**

OR

- Describe the modern concepts of mountain building processes. **10**



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T.Y. B.Sc. (Semester – IV) Examination, 2012
STATISTICS (Principal) (Paper – III)
ST 343 : Statistical Process Control (Offline Methods)
(2008 Pattern)

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. Attempt **each** of the following :

a) In each of the following cases choose the correct alternative. **(1 each)**

i) For a single sampling plan, the exact probability of acceptance of a lot is calculated by using.

- A) Normal distribution
- B) Exponential distribution
- C) Hypergeometric distribution
- D) Poisson distribution

ii) In case of double sampling plan N, n_1, n_2, c_1, c_2 , let d_1 be number of defectives obtained in the first sample. A second sample of size n_2 is selected from remaining $N - n_1$ items if

- A) $d_1 \leq c_1$
- B) $d_1 > c_2$
- C) $c_1 \leq d_1 < c_2$
- D) $c_1 < d_1 \leq c_2$

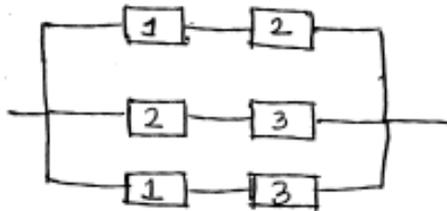
iii) The reliability of a parallel system with three independent components with individual reliability 0.9, 0.5, 0.8 is

- A) 0.01
- B) 0.99
- C) 0.36
- D) 0.5

P.T.O.



iv) Consider a system with following reliability block diagram



Which of the following is a path vector ?

- A) (1, 1, 0)
- B) (0, 0, 0)
- C) (0, 0, 1)
- D) (0, 1, 0)

b) In **each** of the following cases, state whether the given statement is **true** or **false** : **(1 each)**

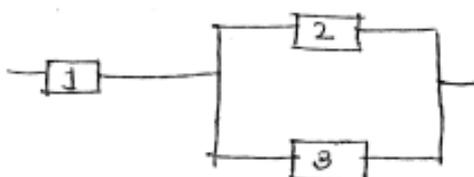
- i) Acceptance sampling is used to protect the purchaser or user against inferior quality of a lot.
- ii) A series system is not a coherent system.

c) Define the following terms : **(1 each)**

- i) Producer's risk
- ii) Lot Tolerance Percent Defective (LTPD).

d) i) State any two advantages of double sampling plan. **1**

ii) Obtain structure function of the system with the following reliability block diagram. **1**

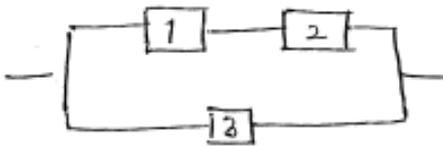




2. Attempt **any two** of the following : **(5 each)**

a) For a single sampling plan $n = 100$, $C = 3$, the lot is large as compared to sample size. Find the value of average outgoing quality AOQ if submitting lot has $p = 0.04$.

b) Consider a system with following reliability block diagram.



Find

- i) all possible state vectors,
 - ii) all possible path vectors,
 - iii) minimal path vectors,
 - iv) all possible cut vectors,
 - v) minimal cut vectors.
- c) Define the terms : IFR, IFRA regarding life time distribution of a component. Show that exponential distribution is IFRA.

3. Attempt **any two** of the following : **(5 each)**

a) Find Producer's risk for a single sampling plan $N = 10,000$, $n = 50$, $c = 2$ given $AQL = 0.06$.

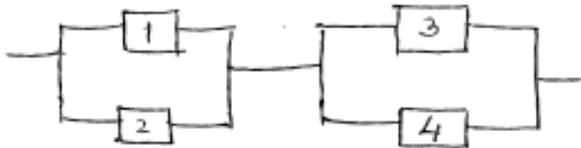
b) Describe the procedure of double sampling plan. Derive expression of Average Sample Number (ASN) for double sampling plan.

c) Write a note on ISO 9001 : 2000.



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

- a) i) Obtain fault tree representation of a system with following reliability block diagram 3



- ii) For a double sampling plan $N = 1500$, $n_1 = 40$, $c_1 = 0$, $n_2 = 60$, $c_2 = 2$ find the value of Average Total Inspection (ATI) if $p = 0.05$. 7

- b) i) Describe the procedure of drawing OC curve for a double sampling plan. 5

- ii) Define hazard rate $r(t)$ of a component at time t show that $r(t) = \frac{f(t)}{\bar{F}(t)}$, if p.d.f. $f(t)$ exists. 5
-



- iv) Sampling frame is a
- List of elements in population
 - List of elements in a sample
 - List of questions in a questionnaire
 - None of the above

b) State whether **each** of the following statements is **True** or **False** : (1 each)

- A sample consists of at least 5% observations from the population.
 - If a systematic sample of size 4 is drawn from a population of size 20, then the number of distinct possible samples is 6.
- c) i) State any two demerits of simple random sampling . 1
- ii) Comment : Regression method is always more efficient than SRSWOR. 1
- d) i) Explain with illustration the concept of 'sampling unit'. 1
- ii) From the list of 600 names and addresses, a simple random sample of 100 names is selected without replacement and 25 wrong addresses were found. Estimate the total number of addresses needing correction in the list. 1

2. Attempt **any two** of the following : (5 each)

- a) In SRSWR, with usual notations, prove $\text{Var}(\bar{x}) = \frac{N-1}{Nn} S^2$ where \bar{x} is sample mean.
- b) Define ratio and regression estimators of the population mean. State the expressions for variances of these estimators. Also state the formulae for relative efficiency of these estimators with respect to SRSWOR.
- c) In a population of 1000 units, the population variance S^2 is 100. What should be the size of the sample taken from it so that 95% of the sample means may differ from the population mean by not more than 0.5 ?

3. Attempt **any two** of the following : (5 each)

- a) Write a note on sampling and non-sampling errors.
- b) In case of stratified random sampling, the cost function is of the form $C = C_0 + \sum_{i=1}^k C_i n_i$. Show that the variance of the unbiased estimator of the population mean is minimum for fixed total cost if $n_i \propto \frac{N_i S_i}{\sqrt{C_i}}$.



- c) Explain the method of systematic sampling. Obtain an unbiased estimator of the population mean under systematic sampling and compare its efficiency with that of SRSWOR.

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

- a) i) State an unbiased estimator of population mean under stratified random sampling. Obtain the expression for its standard error under proportional allocation. 5

- ii) State the requirements of a good questionnaire . 5

- b) i) With usual notation, ignoring f. p. c., prove that
$$\text{Var}(\bar{y})_{\text{SRSWOR}} \geq \text{Var}(\bar{y}_{\text{st}}) \text{ P.A.}$$
 6

- ii) The values $\{(x_i, y_i), i = 1, 2, 3, 4\}$ in a sample of size 4 are :

$$x_i : 1 \quad 3 \quad 4 \quad 4$$

$$y_i : 5 \quad 8 \quad 7 \quad 4$$

The population total of 100 observations of X is known to be 250. Obtain the ratio and regression estimates of the population total Y. 4



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Seat No.	
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T.Y.B.Sc. (Semester – IV) Examination, 2012
GEOGRAPHY
Gg.346 : Fundamentals of Geoinformatics (Paper – VI)
(2008 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) Mention the types of resolutions.
 - b) What is a Sensor ?
 - c) What do you mean by Push broom Scanner ?
 - d) What is 'Pixel' ?
 - e) Define the term IR spectrum.
 - f) Give any two keys of visual image interpretation.
 - g) What is LISS stands for ?
 - h) What is the spatial resolution of IRS LISS ?
 - i) Give any two advantages of Landsat images.
 - j) What is annotation strip ?
2. Write short answers (**any two**) : **10**
- a) Types of platforms.
 - b) What are optical mechanical scanners ?
 - c) What is IKONOS ?

P.T.O.



3. Write short notes (**any two**) : **10**

- a) Infrared scanners.
- b) Elements of image interpretation.
- c) INSAT series satellites.

4. Write an account of importance of Thermal infrared images and Radar Images. **10**

OR

Give an account on Digital Image Processing.



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
MICROBIOLOGY (Paper – III)
MB-343 : Metabolism
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) **All questions are compulsory.**
2) **All questions carry equal marks.**
3) **Draw neat labeled diagrams wherever necessary.**

1. Attempt the following : 10
- a) Define :
 - i) Osmosis
 - ii) Oxidative phosphorylation.
 - b) What is group translocation ?
 - c) ΔG^0 of hydrolysis of ATP to ADP + Pi is _____ at pH 7.0.
 - d) How many malonyl-CoA molecules are required for synthesis of palmitate ?
 - e) What are the components of starch ?
 - f) State **True** or **False** :
 - i) Green sulfur bacteria show anoxygenic photosynthesis.
 - ii) In urea cycle four ATP molecules are generated.
 - iii) In ETC the electrons has the tendency to move from negative to positive redox potential.
 - iv) Acetyl-CoA is the ultimate end product of fatty acid degradation.
2. Attempt **any two** of the following : 10
- a) Write a short note on 'Photosynthetic apparatus' in bacteria.
 - b) Explain-how urea formation occurs though Krebs-Hansleit cycle.
 - c) Explain the mechanism of starch biosynthesis.

P.T.O.



3. Attempt **any two** of the following : **10**
- a) Explain substrate level phosphorylation with suitable example.
 - b) Describe different types of Passive Transport in Bacteria.
 - c) Explain cyclic photophosphorylation with a suitable diagram.
4. Attempt **any one** of the following : **10**
- a) What are high energy compounds ? Explain why ATP and acyl phosphate are high energy compounds.
 - b) Describe steps in fatty acid biosynthesis.
-



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
MICROBIOLOGY (Paper – V)
MB-345 : Fermentation Technology – II
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

1. Attempt the following : 10

a) Define :

i) Lager

ii) SOP.

b) State **True** or **False** : *Aspergillus niger* is used for large scale production of citric acid.

c) _____ is the Hop plant used in beer making.

d) Write any two applications of Lipase.

e) Match the following :

A

i) Polio Vaccine

ii) SCP

iii) Vitamin B2

iv) Penicillin

v) Acetic acid

B

a) Phenyl acetic acid

b) Orleans Process

c) Salk and Sabin

d) *Torulopsis utilis*

e) *Ashbya gossypii*

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

a) Draw the flow chart for production of streptomycin.

b) Explain surface culture process for production of citric acid.

c) Enlist various steps involved in making of cheese.

P.T.O.



3. Attempt **any two** of the following : **10**
- a) Explain in brief the role of Biotin in production of Glutamic acid.
 - b) Describe in brief the manufacture of yeast as Single Cell Protein (SCP).
 - c) Write in brief the manufacture of Tetanus toxoid.
4. Attempt **any one** of the following : **10**
- a) Explain with flow chart the production of Amylase and write a note on its applications.
 - b) Describe in detail the large scale production of Beer.
-



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Seat No.	
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**T.Y. B.Sc. (Semester – IV) Examination, 2012
MICROBIOLOGY (Paper – VI)
MB – 346 : Soil and Agricultural Microbiology
(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks :40

- N.B. :** 1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Draw neat, labeled diagram wherever necessary.*

1. Attempt the following : 10
- a) Define :
- i) Denitrification
 - ii) Humus
 - iii) Bioaugmentation.
- b) State **True** or **False** :
- i) Enzyme nitrogenase is sensitive to oxygen.
 - ii) Middle lamella of plants does not contain pectin.
- c) Name any two raw materials used for biogas production.
- d) Give causative agent and host for wilt disease of plants.
- e) Write names of any two Iron ores used in leaching.
- f) Give an example of biological control of plant diseases.
- g) Brown, crusty lesion on citrus fruits is observed in _____ disease.
2. Attempt **any two** of the following : 10
- a) Write flow chart for the preparation of Bioinoculants using *Azotobacter* sp.
 - b) Draw phosphorous cycle. Explain various steps in brief.
 - c) What is leaching ? Discuss Chalcopyrite leaching.

P.T.O.



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

- a) Explain the biochemical mechanism of nitrogen fixation by *Rhizobium sp.*
- b) What is anaerobic digestion ? Draw a neat labeled diagram of an Anaerobic digester.
- c) Explain methods of applications of Bioinoculants.

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

- a) With the help of a neat labeled diagram, explain Nitrogen cycle.
- b) Describe any five classes of plant diseases based on symptoms.



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
ELECTRONIC SCIENCE (Paper – I)
EL-341 : Advanced Communication Systems
(2008 Pattern) (New)

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 **all** of the following :

- a) What is aliasing error ? 1
- b) Draw the radiation pattern of isotropic radiator. 1
- c) Write any two methods to suppress the unwanted side bands. 1
- d) Give the name of non semiconductor device used in high power amplifiers. 1
- e) What is DPCM ? Write its advantages. 2
- f) An antenna has radiation resistance of 72Ω and loss resistance of 8Ω . What is its efficiency ? 2
- g) “In delta modulation system, the quantizing noise is very high”. Comment. 2
- h) “Balanced modulator acts as mixer”. Comment. 2

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

- a) Compare BPSK and QPSK modulation techniques. 4
- b) Derive the wave equation for free space in terms of electric field. 4
- c) What is blue tooth technology ? Write its four features and two applications. 4

P.T.O.



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

- a) Explain RF cable impedance matching. 4
- b) Explain the principle of PCM. State any two advantages and two disadvantages of PCM. 4
- c) With neat diagram, explain phase shift method of side band suppression. 4

4. Answer **any two** of the following :

- a) With the help of block diagram, explain the working of speed gun radar. 6
 - b) Explain working of ratio detector. State its advantages. 6
 - c) Write short notes on :
 - i) Turnstile array antenna
 - ii) Yagi antenna. 6
-



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Seat
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
ELECTRONIC SCIENCE
EL-343 : Power Electronics (Paper – III)
(New Course) (2008 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. Attempt **all** of the following :

- a) State the advantages of three phase signal. **1**
- b) Draw soft reverse recovery characteristics of diode. **1**
- c) Define transconductance parameter of power MOSFET. **1**
- d) Why grounding is needed in power electronics ? **1**
- e) Draw turn on characteristics of thyristor and list types of it. **2**
- f) State the working principle of clamp-on meter. **2**
- g) A buck regulator has an input voltage of 12V and required output voltage is 5 V at $R = 500 \Omega$. Determine the duty cycle k. **2**
- h) The charging current to turn on thyristor is 4 mA and capacitance of reverse bias junction in thyristor is 5 PF, determine $\frac{dv}{dt}$. **2**

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

- a) State the limitations of half wave rectifier. Explain working of single phase full wave rectifier with centre tapped transformer. Obtain an expression for TUF and PF. **4**
- b) Explain the principle of step up operation of chopper with the help of circuit diagram and waveform. Obtain an expression for average output voltage. **4**
- c) Draw the block diagram of online UPS and off line UPS. Explain its working principle. State its specification parameters. **4**

P.T.O.



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

- a) Draw the circuit diagram of single phase full converter and explain its working with waveform. **4**
- b) Define the term power factor. State the types of powermeter and explain any one of them. **4**
- c) What are the difference between half-bridge and full bridge inverters ? Explain the working of single phase full bridge inverter with proper circuit diagram. **4**

4. Answer **any two** of the following :

- a) Draw the equivalent circuit of dc series motor and explain its working. Which factor determine the speed control of it ? Draw its characteristics. **6**
- b) What is a microelectronic relay ? Explain in detail the photovoltaic relay. **6**
- c) i) Draw the control characteristics for transistor and MOSFET as a switch. **3**
ii) State the types of filter used in rectifier. Explain it with suitable diagram. **3**



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
ELECTRONIC SCIENCE (Paper – V)
EL-345 : Mathematical Methods and Analysis using MATLAB
(New Course) (2008 Pattern)

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.**
4) **Log table/calculator is allowed.**

1. Answer **all** of the following :

- a) Create a row vector x for values from 1 to 10 using MATLAB. 1
- b) Define Discrete Time Signal. 1
- c) How a periodic function f(t) is described by Fourier series ? 1
- d) Express Laplace equation in Cartesian co-ordinate system. 1
- e) Explain plot command in MATLAB with color and type of marker options. 2
- f) Define poles and zeros of network function. How they are useful in network analysis ? 2
- g) Write the polyfit command to fit an exponential function $Y = b10^{mx}$. 2
- h) Compute output of following MATLAB program :

```
>> a = 7 ;  
>> E = 5 ;  
>> c = A + E ;  
>> d = [1, a + E ; a, c]
```

2

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

- a) State the general format of 2D plot command in MATLAB. Explain formatting a plot by using title, text commands. 4

P.T.O.



b) Obtain inverse Laplace transform of

$$I(s) = \frac{10}{s^2 + 5s + 4}$$

Write MATLAB command to evaluate it.

4

c) Determine the Fourier coefficients a_0 , a_n of the periodic function $f(x)$ as given by

$$\begin{aligned} f(x) &= 0, \text{ if } -\pi < x < 0 \\ &= 1, \text{ if } 0 < x < \pi \end{aligned}$$

4

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

a) Find roots of algebraic equation $f(x) = x^2 - 2x - 3$ using MATLAB function roots. Also elaborate use of poly command in MATLAB.

4

b) Plot in green colour $y = \sin x$ taking 120 linearly spaced points in the interval $0 \leq x \leq 2\pi$. Label the axes and put "sinewave function" name to the graph.

4

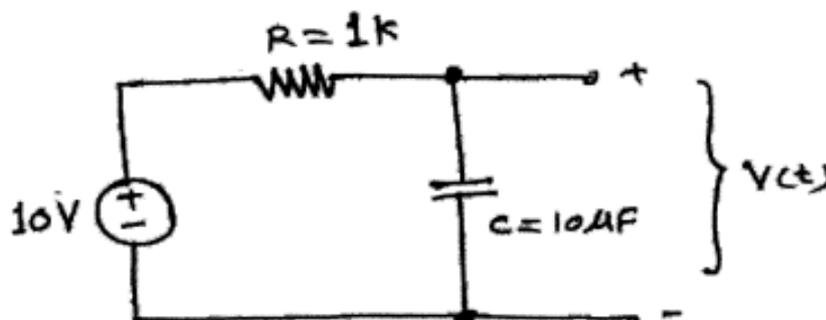
c) Find Laplace transform of $\sin at$, $\sinh at$.

4

4. Answer **any two** of the following :

a) Write MATLAB program to plot the voltage across capacitor in the following circuit. Give title as "RC time constant", label axes.

6





- b) Explain how you will fit a linear curve for the data given below by using basic fitting tools from MATLAB. 6

x	5	10	15	20	25	30
y	15	32	47	63	89	101

- c) Write Laplace equation, Poisson equation in 3D using Cartesian co-ordinates. Solve Laplace equation using separation of variable method. 6

OR

4. Answer **all** of the following :

- a) Define Laplace transform for a function $f(t)$. Explain MATLAB functions to evaluate Laplace transform and inverse Laplace transform. 4

- b) Determine Fourier coefficient a_0 for full wave rectifier output given by the function $f(t)$ as

$$\begin{aligned} f(t) &= \sin \omega t, \text{ if } 0 < \omega t < \pi \\ &= -\sin \omega t, \text{ if } -\pi < \omega t < 0 \end{aligned} \quad \text{4}$$

- c) Explain the format of the following MATLAB commands :

- i) Mesh plot
- ii) Mesh grid
- iii) line
- iv) title. 4



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Seat
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES
DS-341 : Management of Military Technology in India (Paper – I)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences **each** : **16**
 - 1) Define 'Management'.
 - 2) What is meant by 'Military Technology' ?
 - 3) What is second grade technology ?
 - 4) What is indigenous technology ?
 - 5) Define Foreign Collaboration.
 - 6) What is Technology acquisition ?
 - 7) What is Technology Absorption ?
 - 8) What is Technology assimilation ?

2. Answer in **8 to 10** sentences (**any two**): **8**
 - 1) How Technology Forecasting is being made ?
 - 2) How Technology helps in weapon development ?
 - 3) Explain the aims and objectives of Dual Use Technologies.

3. Write short notes on (**any two**) : **8**
 - 1) Transfer of Technology
 - 2) India : A rising Global Power
 - 3) R & D in India

4. Answer in **16 to 20** sentences (**any one**) : **8**
 - 1) Write an essay on 'Science and Technological Education in India'.
 - 2) Explain how the application of first grade technology is helpful in Military Superiority.

B/II/12/110



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – IX)
DS: 349 (A) : Management of Defence Production and Logistics in India
(2008 Pattern) (Ele – IX)

Time : 2 Hours

Max. Marks : 40

1. Answer in **2 to 4** sentences : **16**
 - 1) State any two projects of DPSU.
 - 2) Define 'Mobilisation'.
 - 3) Under whom DRDO is working ?
 - 4) Write any four principles of logistics.
 - 5) State the meaning of MDL.
 - 6) Write any two functions of Department of Defence Production.
 - 7) What do you mean by logistics ?
 - 8) State the meaning of H.A.L.
2. Answer in **8 to 10** sentences (**any two**) : **8**
 - 1) Explain in brief a concept of Defence Production.
 - 2) Write in brief basic objectives of DRDO.
 - 3) Explain in short role of G.S.L. for naval preparedness of India.
3. Write short notes on (**any two**) : **8**
 - 1) Concept of "just in time".
 - 2) O.F.
 - 3) Concept of foreign collaboration.
4. Answer in **16 to 20** sentences (**any one**) : **8**
 - 1) Describe the role of public sector in Defence Production of India.
 - 2) Highlight on mobilization of logistics elements of war.

P.T.O.



Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – IX)
DS : 349 (B) : Internal Security of India – II (Optional)
(2008 Pattern) (Ele – IX)

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) Write any two characteristics of Insurgency.
 - 2) What do you mean by socio-economic dimensions of national security ?
 - 3) What do you mean by Threat Perception ?
 - 4) Write the meaning of Secessionist force.
 - 5) What do you mean by Globalization of Terrorism ?
 - 6) Write any two difficulties in combating Terrorism.
 - 7) What do you mean by state sponsored Terrorism ?
 - 8) What do you mean by peace enforcement force ?
2. Answer in **8 to 10** sentences each (**any two**) : **8**
- 1) Explain role of the state to the problem of Cross-Border Terrorism.
 - 2) Discuss Globalization of Terrorism and its impact on India.
 - 3) What are the different dimensions of humane security ? Explain.



3. Write short notes on (**any two**) : **8**
- 1) Role of Media to the problem of internal security of India.
 - 2) Role of N.G.O. to the problem of internal security of India.
 - 3) Ethnicity and Internal security of India.
4. Answer in **18 to 20** sentences (**any one**) : **8**
- 1) Evaluate internal security challenges to North-East Region of India.
 - 2) Write a note on the role of the state to the problems of internal security.
-



Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – IX)
DS: 349 (C) : India's Maritime Security – II (Optional)
(2008 Pattern) (Ele – IX)

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) How you would like to Define Zone of peace ?
 - 2) What do you mean by Strategic significance ?
 - 3) What do you mean by Maritime security ?
 - 4) Write the meaning of Secessionist force.
 - 5) How you would like to define sea power ?
 - 6) Write any two characteristics of India's maritime strategy.
 - 7) What do you mean by Maritime Elements ?
 - 8) Define Territorial seas.

2. Answer in **8 to 10** sentences each (**any two**) : **8**
 - 1) Explain "Freedom to use the seas".
 - 2) Discuss strategic significance of Indian Ocean.
 - 3) Explain role of Coast Guard.

3. Write short notes on (**any two**) : **8**
 - 1) New challenges to maritime trade.
 - 2) Policies of Pakistan in the Indian Ocean.
 - 3) Role of sea power.

4. Answer in **18 to 20** sentences (**any one**) : **8**
 - 1) Explain major power rivalry in Indian Ocean and its impact on Indian security.
 - 2) Write a note on India's Maritime Military Strategy.



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
ENVIRONMENTAL SCIENCE (Paper – II) (New Course)
ENV-342 : Nature Conservation (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : 1) *All questions are compulsory.*
2) *Neat and labeled 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 Heritage sites ?
 - b) Name any 2 Wildlife Sanctuaries of Maharashtra.
 - c) Write the full form of IUCN.
 - d) What is the State animal of Maharashtra ?
 - e) What do you mean by Captive breeding ?
 - f) Name any 2 protected mammal species of India.
 - g) Name any 2 NGO's working in Nature Conservation.
 - h) What is Red Data Book ?
 - i) Define Population Genetics.
 - j) Define In-situ conservation.

2. Write a short note on (**any two**) : **10**
 - a) Conservation status as per IUCN categories.
 - b) Protected Area Network in India.
 - c) Project Tiger.

3. Answer **any two** from the following : **10**
 - a) How is eco-tourism better than tourism for nature conservation ? Explain.
 - b) Discuss extreme activism and practical sustainable effort for nature conservation through one example each.
 - c) Describe the concept of seed bank with example. Give its merits, limitations and challenges.

4. Attempt **any one** of the following : **10**
 - a) Describe the work/role of any 5 personalities in nature conservation.
 - b) Explain Ex-Situ conservation methods with suitable examples. Describe their merits, limitations and challenges.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
ENVIRONMENTAL SCIENCE (Paper – V) (New Course)
ENV-345 : Environmental Governance and Equity : EMS and ISO14000
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) *All questions are compulsory.*
2) *Neat and labeled diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
- What is environmental audit ?
 - What is the standard limit of COD for effluent to be discharged on inland surface water ?
 - What is the main function 'Technical Committee' ?
 - What is meant by 'Ship Recycling' ?
 - Write full form for 'ISO'.
 - Mention any two benefits associated with renewable energy.
 - What is the standard limit of NO₂ (annual average) for residential area ?
 - Mention any two functions of BIS.
 - Write full form for 'ESR'.
 - What is the constitutional provision related with article 51-A-(g) ?
2. Write a short note on (**any two**) : **10**
- Environment Management System.
 - Environmental Standards.
 - Environmental Education.

P.T.O.



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

- a) What are the salient features of 'National Environmental Policy' ?
- b) Explain in detail Plan, Do, Check and Act Model.
- c) What are the problems involved in environmental protection ?

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

- a) What is EMS ? Discuss the benefits of ISO-14000 and add a note on stages of environmental audit.
- b) Explain in detail about environmental governance and regulation in India.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION (VOCATIONAL)
Paper – V : Entrepreneurship Development
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) Question number **one** is **compulsory**.
 - 2) Answer **any three** questions from the remaining questions.
 - 3) Provide suitable examples **wherever** necessary.
 - 4) Figures to the **right** indicate **full** marks.

1. Discuss, by giving suitable examples the qualities of an entrepreneur. 10
2. What is the role of a professional manager ? How does it compare with that of an entrepreneur ? 10
3. Discuss how entrepreneurs can be classified. Give suitable examples to support your answer. 10
4. What is a sick industry ? What can be the causes for the industrial sickness ? 10
5. Write short notes on **any two** of the following : 10
 - a) Small scale industry.
 - b) Administrative traits of an entrepreneur.
 - c) Barriers faced by entrepreneurs.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
COMPUTER HARDWARE & NETWORK ADMINISTRATION (Vocational)
Paper – V : Entrepreneurship Development
(New Course) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **all** of the following : **(10×1=10)**
- i) What is the long form of HRD ?
 - ii) What is a Balance Sheet ?
 - iii) What is SICOM ?
 - iv) What is SIDBI ?
 - v) What is the meaning of SSI Unit ?
 - vi) What is a 'Working Capital' ?
 - vii) What is a MIDC ?
 - viii) What is the role of 'Maharashtra State Electricity Board' ?
 - ix) Which Tax we pay on our excess income ?
 - x) Is 'Place' one of the important factors of Marketing Mix ?
2. Attempt **any two** of the following : **(2×5=10)**
- a) What is the role of Consultancy Organizations in E.D. ?
 - b) What are the different forms of Business Organizations ?
 - c) What is the role of Human Resource Department in Entrepreneurship Development Program of India ?

P.T.O.



3. Attempt **any two** of the following : **(2×5=10)**

- a) Explain in brief the concept of Marketing Mix.
- b) What are the different types of Entrepreneurs ?
- c) Explain the importance of SWOT Analysis.

4. Attempt **any one** of the following : **(1×10=10)**

- a) What are the merits of a Co-operative Organization ? What are the various Funding Agencies in India ?
 - b) Explain the application of taxes given below :
 - 1) VAT
 - 2) Service Tax
 - 3) Excise Rules
 - 4) Income Tax
 - 5) Patent Rules.
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T.Y. B.Sc. (Semester – IV) Examination, 2012
SEED TECHNOLOGY : ENTREPRENEURSHIP DEVELOPMENT
(Vocational Paper – V)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Sketch neat labelled figures wherever necessary.*

1. Answer the following : (1×10=10)
- a) Define entrepreneurship.
 - b) Write the advantage of partnership.
 - c) Give the concept of marketing mix.
 - d) Mention one source for finance.
 - e) Write one criterion used for selection of new product.
 - f) What is IDBI ?
 - g) Write any two channels for marketing.
 - h) What is the full form of VAT ?
 - i) What is patent rule ?
 - j) What is sole proprietorship ?
2. Attempt **any two** of the following : (2×5=10)
- a) What are the key elements of entrepreneurship ? Give a brief account of any two.
 - b) Write about Maharashtra Industrial Development Corporation (MIDC).
 - c) Write an account on marketing strategy.

P.T.O.



3. Write short notes on **any two** of the following : **(2×5=10)**
- a) Characteristics of an Entrepreneur.
 - b) Communication skills.
 - c) Entrepreneurial culture
4. List the names of funding agencies and write an account on any two funding agencies **10**

OR

Explain in detail development of entrepreneurship.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION (Vocational)
Paper – VI : Radio Software
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : 1) Attempt **any four** questions.
2) Give suitable examples **wherever** necessary.
3) Figures to the **right** indicate **full** marks.

1. Compare the role of the Radio and the Newspaper as media of communication. **10**
2. Discuss with suitable examples the challenges you would face while producing a radio programme. **10**
3. You are asked to interview an Olympic Gold Medalist. Write down five questions you would ask him/her. **10**
4. Discuss the role of an anchor in a discussion programme. **10**
5. Discuss the importance of the Broadcast code. **10**
6. What is an O.B. Programme ? What care should be taken to broadcast a live O.B. Programme ? **10**

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T.Y. B.Sc. (Semester – IV) Examination, 2012
COMPUTER HARDWARE AND NETWORK ADMINISTRATION (Vocational)
Paper – VI : Network Concepts – II
(New Course) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **all** of the following : **(10×1=10)**
 - i) What is a MODEM ?
 - ii) Explain Eavesdropping.
 - iii) Give one function of a Router.
 - iv) What is a Phishing ?
 - v) What is a VOIP ?
 - vi) What is a Gateway ?
 - vii) What is a Virus ?
 - viii) What is a VLAN ?
 - ix) TCP/IP protocol operates on which layer of the OSI Model ?
 - x) Give one application of VPN.

2. Attempt **any two** of the following : **(2×5=10)**
 - a) Explain the importance of environmental and site requirement in Network Planning.
 - b) Write a note on necessity of an Antivirus.
 - c) What is a Firewall ? Give its any three uses.

3. Attempt **any two** of the following : **(2×5=10)**
 - a) Explain in brief various active attacks faced during accessing the internet.
 - b) Explain importance of a Proxy Server.
 - c) Explain the steps to share a drive in a network.

4. Attempt **any one** of the following : **(1×10=10)**
 - a) Write the Installation Procedure for Windows XP.
 - b) Explain the term 1) Backup 2) Cold site 3) Warm site 4) Hot sites 5) Mirroring.



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T.Y. B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – I)
MT-331 : Set Theory and Logic
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**

- i) The collection of sets $\{\{1, 3\}, \{2\}, \{4, 5\}\}$ is a partition of $\{1, 2, 3, 4, 5\}$. Write the accompanying equivalence relation.
- ii) Determine :
 - a) $\phi \cap \{\phi\}$
 - b) $\{\phi, \{\phi\}\} - \{\phi\}$
- iii) Give an example of a function $f : \underline{\mathbb{Z}}^+ \rightarrow \underline{\mathbb{Z}}^+$ which is onto but not one one.
- iv) Show that $\underline{\mathbb{R}}$ is similar to $\underline{\mathbb{R}}^+$.
- v) Translate the following English sentence into a logical expression :
“You can access internet from the campus only if you are a computer science student or you are not a freshman”.
- vi) Find the dual of the compound proposition $(p \wedge \neg q) \vee (q \wedge F)$.
- vii) Write the converse and contrapositive of the statement :
If n is a perfect square then $n + 2$ is a perfect square.

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

- i) Using Venn diagram check whether it is possible to find three sets A , B and C of U such that
 $C \neq \phi$, $A \cap B \neq \phi$, $A \cap C = \phi$, $(A \cap B) - C = \phi$

P.T.O.



ii) Show that the following statements about sets A, B are equivalent to one another.

I) $A \subseteq B$

II) $A \cap B = A$

III) $A \cup B = B$

iii) Show that the set \mathbb{Q} of rational numbers is denumerable.

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

i) Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent by developing a series of logical equivalences.

ii) Use rules of inference to show that the hypotheses “Rocky works hard”, “If Rocky works hard, then he is a dull boy”, and “If Rocky is a dull boy, then he will not get the job” imply the conclusion “Rocky will not get the job”.

iii) a) Show that the conditional statement $[\neg p \wedge (p \vee q)] \rightarrow q$ is a tautology by using truth tables.

b) Show that $\neg(p \oplus q)$ and $p \leftrightarrow q$ are logically equivalent.

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

i) a) For each natural number n, if $\overline{A} = n$ then show that A is not similar to a proper subset of itself. 6

b) Express the negation of the statement $\forall x \exists y (xy = 1)$ so that no negation precedes a quantifier. 4

ii) a) Translate each of these statements into logical expressions using predicates, quantifiers and logical connectives 6

I) No one is perfect

II) Atleast one of your friends is perfect

III) Not everybody is your friend or someone is not perfect.

b) Prove that $(n + 1)^3 \geq 3^n$ if n is a positive integer with $n \leq 4$. 4



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T.Y. B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – IV)
MT – 334 : Group Theory
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following :

10

- i) Let $G = \left\{ \begin{bmatrix} x & x \\ x & x \end{bmatrix} \mid x \in \mathbb{R}, x \neq 0 \right\}$ be a group with respect to usual multiplication of matrices. Find the identity element in G .
- ii) If G is a group of even order, prove that it has an element $a \neq e$ satisfying $a^2 = e$.
- iii) Let $U_{18} = \{x \in \mathbb{Z} \mid \gcd(x, 18) = 1, 0 < x \leq 18\}$, be a cyclic group with respect to multiplication modulo 18. Find the number of generators of U_{18} .
- iv) Let $(\mathbb{Q}, +)$ be the group of rational numbers with respect to addition and (\mathbb{Q}^+, \cdot) be the group of positive rational numbers with respect to multiplication. Show that $(\mathbb{Q}, +)$ is not isomorphic to (\mathbb{Q}^+, \cdot) .
- v) Find the least natural number 'n' such that the permutation group S_n has an element of order 35.
- vi) Give an example of a group G and its two subgroups H and K such that $H \cup K$ is not a subgroup of G .
- vii) Let G be any group, g a fixed element in G . Define $\phi : G \rightarrow G$ by $\phi(x) = gxg^{-1}$ for all $x \in G$. find the Kernel of the homomorphism ϕ .

P.T.O.



2. Attempt **any two** of the following : 10
- i) If H is a nonempty finite subset of a group G and H is closed with respect to operation in G , then prove that H is a subgroup of G .
 - ii) Prove that any group of prime order is cyclic.
 - iii) Let G be a group of order 4. If $x^2 = e$ for all $x \in G$, where e is an identity element in G , then prepare the composition table for the group G .
3. Attempt **any two** of the following : 10
- i) Show that the subgroup N of G is a normal subgroup of G if and only if every left coset of N in G is a right coset of N in G .
 - ii) State Lagrange's theorem, and show that converse of Lagrange's theorem is not true.
 - iii) Let $\rho = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 2 & 3 & 4 & 5 & 1 & 7 & 8 & 9 & 6 \end{pmatrix}$ be a permutation in the group S_9 .
 - a) Write ρ as a product of disjoint cycles.
 - b) Find order of ρ .
 - c) Write ρ as a product of transpositions.
 - d) State whether ρ is odd or even ?
 - e) Find inverse of ρ .
4. Attempt **any one** of the following : 10
- i) State and prove Cayley's theorem.
 - ii) a) Show that a homomorphism ϕ of a group G in to a group \bar{G} with Kernel K is an isomorphism of G in to \bar{G} if and only if $K = \{e\}$.
 b) Show that any infinite cyclic group is isomorphic to $(\mathbb{Z}, +)$ the group of integers with operation addition.



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T.Y. B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – V)
MT – 335 : Ordinary Differential Equations
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**

i) Find the family of orthogonal trajectories to the curves $y = ce^x$.

ii) Solve the linear differential equation

$$x \frac{dy}{dx} - 3y = x^4.$$

iii) Show that $y_1 = e^x$ and $y_2 = e^{-x}$ are linearly independent solutions of the differential equation $\frac{d^2y}{dx^2} - y = 0$ on any interval.

iv) Determine the nature of the point $x = 0$ for the differential equation

$$x \frac{d^2y}{dx^2} + y \sin x = 0.$$

v) Show that $x = 2e^{10t}$, $y = e^{10t}$ and $x = 3e^{3t}$, $y = -2e^{3t}$ are solutions of the

$$\text{system } \frac{dx}{dt} = 7x + 6y$$

$$\frac{dy}{dt} = 2x + 6y.$$

vi) Show that the series $y = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$ satisfies differential equation

$$\frac{d^2y}{dx^2} = -y.$$

vii) Is the differential equation $\cos y - x \sin y \frac{dy}{dx} = \sec^2 x$ exact ?

P.T.O.



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

i) Define Bernoulli's differential equation and explain the method of solving it.

ii) Solve the differential equation $\frac{dy}{dx} + y \cot x = 2x \operatorname{cosec} x$.

iii) Solve the differential equation $x^2 \frac{dy}{dx} - 3xy - 2y^2 = 0$.

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

i) If y_1 is a nonzero solution of the differential equation

$\frac{d^2y}{dx^2} + P(x)\frac{dy}{dx} + Q(x)y = 0$ and if $y_2 = vy_1$, with $v(x) = \int \frac{1}{y_1^2} e^{-\int P dx} dx$, then show that y_1 and y_2 are linearly independent.

ii) Find a particular solution of differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = (1 + e^{-x})^{-1}$ by using variation of parameter.

iii) Find the solution of $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 4x^2$ that satisfies $y(0) = 0$ and $y'(0) = 1$ by using method of undetermined coefficients.

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

i) a) If $W(t)$ is the Wronskian of the two solutions of the homogeneous system of differential equations, then prove that $W(t)$ is either identically zero or nowhere zero on $[a, b]$.

b) Solve the system of differential equations

$$\frac{dx}{dt} = 3x - 4y$$

$$\frac{dy}{dt} = x - y.$$

ii) Use the method of Frobenius series to solve the differential equation

$$2x^2 \frac{d^2y}{dx^2} + x(2x + 1) \frac{dy}{dx} - y = 0 \text{ about the regular singular point } x = 0.$$



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T.Y. B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – VI)
MT-336 : Problem Course Based on MT-334 and MT-335
(2008 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 books.*
4) *Tie answer books of both Sections together.*

SECTION – I

(Group Theory)

1. A) Attempt **any three** of the following : **6**
- i) If G is a group such that $(ab)^2 = a^2b^2$ for all $a, b \in G$, show that G is abelian.
 - ii) Let G be a group containing elements of order 1 to 5. What is the minimum possible order of G .
 - iii) Let G be a cyclic group of order 8 and $a \in G$ be its generator. Find all generators of G .
 - iv) Let G be any abelian group, define $\phi : G \rightarrow G$ by $\phi(x) = x^3$ for all $x \in G$. Is ϕ a homomorphism ? Justify your answer.
- B) Attempt **any one** of the following : **4**
- i) Let G be a group and H is a subgroup of index 2 in G , prove that H is normal subgroup of G .
 - ii) Let G be a non empty set closed under an associative product satisfying following conditions.
 - a) There exist $e \in G$ such that $ea = e$ for all $a \in G$.
 - b) Given $a \in G$, there exists an element $y(a) \in G$ such that $y(a)a = e$.
- Prove that G is a group under this product.

P.T.O.



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

10

i) If group G has no nontrivial subgroups, show that G must be finite of prime order.

ii) Let S_n be a group of permutations on n -symbols. If A_n denote the set of all even permutations in S_n . Show that A_n is a subgroup of S_n and order of

$$A_n = \frac{n!}{2}.$$

iii) Let G be the group of all non zero complex numbers under multiplication and

$$\bar{G} = \left\{ \begin{bmatrix} a & b \\ -b & a \end{bmatrix} \mid a^2 + b^2 \neq 0, a, b \in \mathbb{R} \right\} \text{ be a group under matrix multiplication.}$$

Show that G and \bar{G} are isomorphic.

SECTION – II

(Ordinary Differential Equations)

3. A) Attempt **any three** of the following :

6

i) Solve the differential equation $x \frac{dy}{dx} = (1 - 4x^2) \tan y$.

ii) Find the integrating factor of the differential equation $ydx + (1 - 2xy^3)xdy = 0$.

iii) Show that the solutions $x = e^{4t}$, $y = e^{4t}$ and $x = e^{-2t}$, $y = -e^{-2t}$ of the system

$$\frac{dx}{dt} = x + 3y$$

$$\frac{dy}{dt} = 3x + y$$

are linearly independent and write the general solution of the system.

iv) Find the general solution of

$$4 \frac{d^2y}{dx^2} + 20 \frac{dy}{dx} + 25y = 0.$$



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

4

i) Solve the differential equation $y \frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^2 = 0$ by using the method of reduction of order.

ii) Find the particular solution of the initial value problem

$$\frac{d^2y}{dx^2} + 4 \frac{dy}{dx} + 5y = 0 \text{ with } y(0) = 1 \text{ and } y'(0) = 0 .$$

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

10

i) Solve the system of the differential equations

$$\frac{dx}{dt} = 4x - 3y$$

$$\frac{dy}{dt} = 8x - 6y .$$

ii) Solve the differential equation

$$\frac{d^2y}{dx^2} + 4y = \tan 2x$$

by using the method of variation of parameters.

iii) Find the power series solutions of the differential equation $\frac{dy}{dx} - y = 2$.



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T.Y. B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – VII & VIII)
MT – 337 : Operations Research (Ele. – I)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**
- i) Identify the direction of increase in z of the function $\text{Max. } z = -x_1 + 2x_2$.
 - ii) Express the following LPP into standard form
 $\text{Max. } z = 2x_1 + 3x_2 + 5x_3$
subject to
 $x_1 + x_2 - x_3 \geq -5$
 $-6x_1 + 7x_2 - 9x_3 \leq 4$
 $x_1 + x_2 + 4x_3 = 10$
 $x_1, x_2 \geq 0, x_3$ unrestricted.
 - iii) Write the dual of the following primal problem
 $\text{Max. } z = 5x_1 + 6x_2$
subject to
 $x_1 + 2x_2 = 5$
 $-x_1 + 5x_2 \geq 3$
 x_1 unrestricted and $x_2 \geq 0$.
 - iv) Determine the mathematical formulation of the transportation problem.
 - v) Define : Unit worth of a resource.
 - vi) What is the rule for recognizing an alternate optimum solution for the transportation problem.
 - viii) Justify whether true or false : Assignment problem is a special case of the transportation problem.

P.T.O.



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

10

- i) Determine all the basic solutions of the following LPP ; and classify them as feasible and infeasible.

$$\text{Max. } z = x_1 + x_2$$

subject to

$$x_1 + 2x_2 \leq 6$$

$$2x_1 + x_2 \geq 16$$

$$\text{and } x_1, x_2 \geq 0.$$

- ii) Consider the following LPP.

$$\text{Max. } z = 40x_1 + 24x_2$$

subject to

$$2x_1 + 5x_2 \geq 480$$

$$8x_1 + 5x_2 \geq 720$$

$$\text{and } x_1, x_2 \geq 0.$$

The optimal simplex tableau at the end of phase I is given as

Basic	x_1	x_2	x_3	x_4	R_1	R_2	Solution
r	0	0	0	0	-1	-1	0
x_1	0	1	$-\frac{4}{15}$	$\frac{1}{15}$	$\frac{4}{15}$	$-\frac{1}{15}$	80
x_2	1	0	$\frac{1}{6}$	$-\frac{1}{16}$	$-\frac{1}{6}$	$\frac{1}{6}$	40

Using phase II, determine the optimum solution of the LPP.

- iii) Solve the following assignment problem for minimum cost.

Job	Worker				
	W_1	W_2	W_3	W_4	W_5
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15



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

10

- i) Find initial basic feasible solution of the following transportation problem by VAM. The entries in the matrix indicate the cost in rupees of transporting a unit from a particular source to a particular destination.

Source	Destination				Supply
	D ₁	D ₂	D ₃	D ₄	
S ₁	6	4	9	1	40
S ₂	20	6	11	3	40
S ₃	7	1	0	14	50
S ₄	7	1	12	6	90
Demand	90	30	50	30	

- ii) A company has 3 plants and 4 warehouses. The supply and demand in units, and the corresponding transportation costs are given. The table given below has been taken from the solution procedure of the transportation problem.

Plant	Warehouse				Supply
	I	II	III	IV	
A	5	10	4	5	10
B	6	8	7	2	25
C	4	2	5	7	20
Demand	25	10	15	5	55

Answer the following questions, giving brief reasons :

- a) Is this solution feasible ?
- b) Is this solution degenerate ?
- c) Is this solution optimal ?



- iii) Determine optimal assignment for four sales representatives to different sales territories where the estimated monthly sales (in lakh rupees) to be made by each of them in different territories are as given below. What will be the total maximum sales ?

Sales Representatives	Sales Territories			
	W	X	Y	Z
A	20	25	22	18
B	25	24	19	21
C	18	20	22	20
D	25	20	17	22

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

10

- i) A company produces two products A and B. The sales volume for A is atleast 80% of the total sales of both A and B. However, the company cannot sell more than 100 unit of A per day. Both products use one raw material whose maximum daily availability is limited to 240 lb a day. The usage rates of the raw material are 2 lb per unit of A and 4 lb per unit of B. The unit prices for A and B are Rs. 200 and Rs. 500 respectively.
- Use the graphical solution to determine the optimal product mix for the company.
 - Determine the worth per unit change in the availability of the raw material and its range of applicability.
- ii) Solve the dual of the following LPP by the simplex method. Also find optimal solution of the primal from the solution of the dual.

$$\text{Min. } z = x_1 + x_2$$

Subject to

$$x_1 + 2x_2 \geq 2, \quad x_1 + 7x_2 \geq 7$$

$$\text{and } x_1, x_2 \geq 0.$$



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T.Y. B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – VII & VIII)
MT-337 : Combinatorics (Ele. – I)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**

- i) How many numbers greater than 3,000,000 can be formed by arrangements of 1, 2, 2, 4, 6, 6, 6 ?
- ii) Let $n \geq 2$. How many onto functions are there from $\{1, 2, 3, \dots, n\}$ to $\{1, 2\}$?
- iii) Solve the recurrence relation $a_n = 5a_{n-1}$, where $n > 1$ and $a_1 = 1$.
- iv) How many non-negative integer solutions are there to the equation $x_1 + x_2 + x_3 + x_4 + x_5 = 28$ with $x_i \geq 1$, $i = 1, 2, 3, 4, 5$.
- v) Determine the number of positive integers that are factors of 300.
- vi) How many ways are there to seat 5 different boys and 5 different girls around a circular table with 10 seats, if boys and girls alternate seats ?
- vii) How many ways are there to pick a man and a woman who are not husband and wife from a group of n married couples ?

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

- i) Find the coefficient of x^7 in the expansion of $(1+3x-2x^3)^{10}$.
- ii) Show by a combinatorial argument that

$$\binom{n}{r} = \binom{n-1}{r} + \binom{n-1}{r-1}$$

- iii) How many even numbers in the range 100 to 999 have no repeated digits.

P.T.O.



3. Attempt **any two** of the following : 10
- i) How many arrangements are there of TAMELY with either T before A or A before M or M before E ?
 - ii) Suppose that X is the set of the first $2n$ positive integers and S is any subset of X with $n + 1$ elements. Show that S contains 2 integers such that one is divisible by the other.
 - iii) How many n -digit ternary sequences are there with at least one 0, at least one 1 and at least one 2 ?

4. Attempt **any one** of the following : 10
- i) a) Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$ for $n \geq 2$ and $a_0 = 5$, $a_1 = 9$.
 - b) Find the number of integer solutions of $x_1 + x_2 + x_3 + x_4 = 30$, $0 \leq x_i \leq 10$, $i = 1, 2, 3, 4$.
 - ii) a) Find a recurrence relation for the number a_n of binary sequences of length n that do not contain the pattern 11.
 - b) Show that any set of 7 distinct integers includes 2 integers x and y such that either $x + y$ or $x - y$ is divisible by 10.



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Seat
No.

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T.Y. B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – VII & VIII) (Ele – I)
MT – 337 (2008 Pattern) : ‘C’ Programming – I

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**

i) Determine which of the following are valid identifiers. If invalid, explain. Why.

a) \$ + ax

b) file_3

ii) Determine which of the following numerical values are valid constants. Also specify the base for each valid integer constant.

a) 1 2 3 4 5 6 7 L

b) 0 5 1 5 15

iii) Determine the value of the following expression : $2 * 3 / 4 * 5 - 3 \% 5 * 2$.

iv) Determine the value of the following expression $023 + 145 * 2$.

v) Explain the meaning of the following function declaration :

double F (double a, int b) ;

vi) Define a one-dimensional, 5-element integer array called t. Assign the values 1, 4, 7, 10, 13 to the array element.

vii) Declare a function called ‘root’ that accepts two integer arguments and returns a float.

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

i) Write a note on while loop.

ii) Write a note on if_else statement.

P.T.O.



iii) Describe the output that will be generated by the following program :

```
# include <stdio.h>

int main () {

    int i, x = 0 ;

    for ( i = 1; i < 10; i *=2){

        x ++ ;

        Printf ("%d", x) ;

    }

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

}
```

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

- i) Write a note on for loop.
- ii) Define a function to find gcd of two integers.
- iii) Write a note on one-dimensional array.

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

- i) a) Write a program to find sum of given numbers.
- b) Describe the unary operators ++, --.
- ii) a) Describe in short use of printf function.
- b) Describe the use of break statement.





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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
MATHEMATICS (Paper – VII & VIII) (Ele. – I)
MT-337 : Differential Geometry
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**

i) Find the unit speed reparametrization of the curve $\gamma(t) = (e^t \cos t, e^t \sin t)$.

ii) Find the curvature of the curve

$$\gamma(t) = \left(\frac{1}{3}(1+t)^{3/2}, \frac{1}{3}(1-t)^{3/2}, \frac{t}{\sqrt{2}} \right).$$

iii) State Frenet-Serret equations.

iv) Show that the circular cylinder

$$S = \{(x, y, z) \in \mathbb{R}^3 : x^2 + y^2 = 1\} \text{ is a surface.}$$

v) State isoperimetric inequality.

vi) Find first fundamental form for the plane $\sigma(u, v) = a + up + vq$.

vii) Show that every isometry is a conformal map.

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

i) Let γ be a unit speed curve in \mathbb{R}^3 with constant curvature and zero torsion.

ii) Find equation of the tangent plane of the surface patch

$$\sigma(u, v) = (u, v, u^2 - v^2) \text{ at } (1, 1, 0).$$

iii) Determine the area of the part of paraboloid $z = x^2 + y^2$ with $z \leq 1$.

P.T.O.



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

10

i) Let k_1 and k_2 be principal curvatures at a point P of a surface patch σ . Prove that if $k_1 \neq k_2$, then any two non-zero principal vectors corresponding to k_1 and k_2 respectively are perpendicular.

ii) Show that the quadric $x^2 + y^2 + 6x - 4y + 3z = 7$ is a smooth surface with an atlas consisting of a single surface patch.

iii) Let $F : [0, \pi] \rightarrow \mathbb{R}$ be a smooth function, such that $F(0) = F(\pi)$. Prove that

$$\int_0^{\pi} \left(\frac{dF}{dt} \right)^2 dt \geq \int_0^{\pi} F(t)^2 dt.$$

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

10

i) a) With usual notation, show that

$$\|\sigma_u \times \sigma_v\| = (EG - F^2)^{1/2}.$$

b) Find k , τ , t , n , b for the curve

$$r(t) = \left(\frac{4}{5} \cos t, 1 - \sin t, -\frac{3}{5} \cos t \right).$$

ii) a) Define second fundamental form and find the second fundamental for the unit sphere.

b) Find the torsion of the circular helix $\gamma(\theta) = (a \cos \theta, a \sin \theta, b\theta)$.



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
PHYSICS (Paper – I)
PH : 331 – Mathematical Methods in Physics
(New) (2008 Pattern)

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 (**one mark each**) : **10**

- a) Write generating function for the Bessel function of first kind.
- b) What do you understand by time dilation ?
- c) Write Laplacian operator in cylindrical co-ordinates.
- d) State the degree and order of a differential equation of the form

$$\left(\frac{dy}{dx}\right)^2 + 2x \frac{dy}{dx} - y = 0.$$

- e) Show that $x = 0$ is a ordinary point of the differential equation
 $(1 - x^2)y'' - 2xy' + l(l + 1) = 0.$
- f) What do you mean by orthogonal co-ordinate system ?
- g) State the postulates of special theory of relativity.
- h) State Fuch's theorem.
- i) Define linearity of differential equation.
- j) A proton moves at a speed of $0.95 C$ and its rest energy is $15.03 \times 10^{-11} J.$
Calculate total energy of a proton.

P.T.O.



2. Attempt **any two** of the following (**5 each**) : **10**
- a) Show that the point $x = \infty$ is an irregular singularity of the Bessel's differential equation

$$x^2 y'' + xy' + (x^2 - n^2) y = 0.$$
- b) Derive an expression for length contraction on the basis of Lorentz transformation equation.
- c) Prove that $(n + 1)P_{n+1}(x) = (2n + 1)x P_n(x) - nP_{n-1}(x).$
3. Attempt **any two** of the following (**5 each**) : **10**
- a) Find the elements of arc lengths and volume element in cylindrical co-ordinates.
- b) Using Rodrigues formula for Legendre polynomials, determine $P_0(x)$, $P_1(x)$ and $P_2(x)$.
- c) Derive the relativistic law of addition of two velocities.
4. A) Attempt **any one** of the following (**8 each**) : **8**
- a) Obtain the series solution for $k = 1$, $a_1 = 0$ of Hermite's differential equation

$$y'' - 2xy' + 2\lambda y = 0.$$
- b) Describe Michelson – Morley experiment and explain the physical significance of negative results.
- B) Attempt **any one** of the following (**2 each**) : **2**
- a) What is increase in the relativistic mass of a particle of rest mass 1 gm when it is moving with velocity $0.8C$?
- b) Prove that $P_n(1) = 1.$
-



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
PHYSICS (Paper – IV)
PH-334 : Atomic and Molecular Physics
(2008 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 calculator is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) What are limitations of Bohr's Theory ?
 - b) What are Stoke's lines ?
 - c) Define fluorescence.
 - d) Define Bohr magneton.
 - e) State Larmour theorem.
 - f) State Daunce and Hunt law.
 - g) Write the electronic configuration of fluorine.
 - h) What are three major types of molecular spectra ?
 - i) State the Pauli's exclusion principle.
 - j) What are applications of Raman spectra ?
2. Attempt **any two** of the following :
- a) What is characteristic X-ray spectrum ? Discuss its origin. **5**
 - b) Determine singlet-triplet separations in terms of interaction energies between two valence electrons in 'SP' configuration using LS coupling scheme. **5**
 - c) Show that vibrational energy level is given by $E_{\psi} = \left(V + \frac{1}{2} \right) h\nu_0$. **5**
Where symbols have their usual meanings.

P.T.O.



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

- a) What voltage must be applied to an X-ray tube for it to emit X-rays with minimum wavelength 5000 AU ? 5
- b) A sample was excited by the 4358 AU line of mercury. A Raman line was observed at 4447AU. Calculate Raman shift. 5
- c) A sample of certain element is placed in 0.30 T magnetic field and suitably excited. How far apart the Zeeman component of the 450 nm spectral line of this element ? 5

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

- a) i) Write a short note on Lande's interval rule. 4
- ii) Explain JJ coupling scheme for two valence electron system using neat vector diagram. 4
- b) What is Raman effect ? Describe the experimental arrangement to observe Raman spectra. 8

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

- a) What is vibrational-rotational spectra ? 2
- b) If $L = 2, S = \frac{1}{2}$ then write the atomic states. 2
-



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
PHYSICS (Paper – V)
PH – 335 : 'C' Programming and Computational Physics
(2008 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 scientific calculator is **allowed**.*

1. Attempt **all** (**one** mark **each**) : **10**
- a) What are 'C' tokens ? Enlist them.
 - b) What are header files in 'C' ? Give example.
 - c) Define absolute error and relative error.
 - d) Compare entry-control loop with exit-control loop.
 - e) What is a pixel ? Give resolution of very high resolution computer screen.
 - f) Give the syntax of circle graphics command.
 - g) Explain for statement with its syntax.
 - h) What are library-functions ? Give two examples.
 - i) Correct the following 'C' statement,
 Scanf ("%f, %d, &amount, &year) :
 - j) What are white-space characters ? Give two examples.
2. Attempt **any two** :
- a) What are storage classes of variables ? Enlist four storage classes, explain in brief. **5**
 - b) Explain switch statement with its syntax an suitable example. **5**
 - c) What are different operators used in 'C' ? Give one example of each. **5**

P.T.O.



3. Attempt **any two** of the following :
- a) Draw the flowchart and write 'C' program to find the sum of digits in a given decimal number. 5
 - b) Give the format a user-define function with its principal components. Explain different types of user-define functions. 5
 - c) Draw flow-chart and write 'C' program to find the smallest number in an array of ten integers. 5
4. A) Attempt **any one** :
- a) Draw flow-chart and write 'C' program to find the root of $f(x) = x^3 - 1.8x^2 - 10x + 17$ using bisection method. 8
 - b) Draw flow-chart and write 'C' program for integrating $\int_0^1 \frac{1}{\sqrt{1-x^2}} dx$ in ten steps. Using Simpson $\frac{1}{3}$ rule. 8
- B) Attempt **any one** :
- a) Compare 'call by value' and 'call by reference' of a function. 2
 - b) Give the size and range of the signed short integers and integers. 2



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
CHEMISTRY (Paper – III)
CH – 333 : Organic Chemistry (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) *All questions are compulsory.*
ii) *Figures to the right indicate full marks.*
iii) *Draw the structures and neat diagram if necessary.*

1. Answer the following :

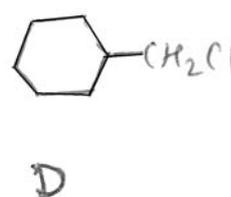
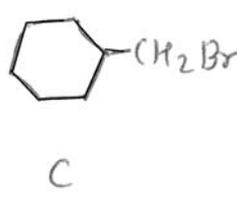
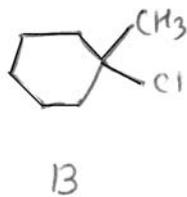
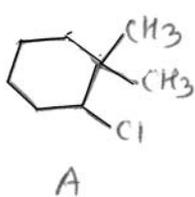
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i) Why urea is neutral though it contains –NH₂ group ?

ii) Write the trivial and IUPAC name for $\text{ph} - \text{CH} = \text{CH} - \overset{\text{O}}{\parallel}{\text{C}} - \text{ph}$.

iii) Draw Zig-Zag structure of hepta, 3-5-dione.

iv) Arrange the following in decreasing order of S_N2 reactivity. Explain your reasoning.

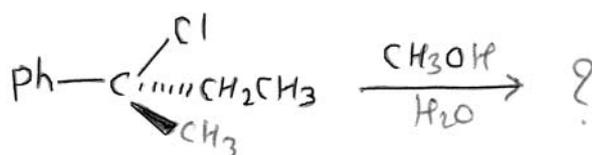


- v) Guanidine is extremely strong base-explain in brief.
vi) 2-phenyl ethyl bromide on heating with NaOCH₃ gives 95 % styrene.
vii) Write the reaction of Ethyl thiol with benzaldehyde.
viii) 1-Butene treated with HBr in presence of peroxide. Write the product.
ix) What is S_N1 reaction ?
x) Salicylic acid is stronger acid than m-hydroxy benzoic acid - why ?

P.T.O.



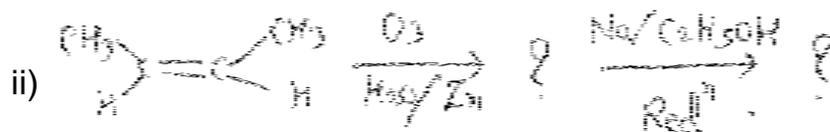
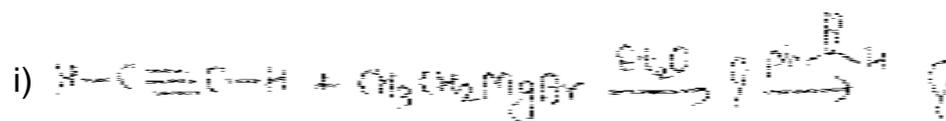
2. A) Answer **any 2** of the following : 6
- i) Discuss the mechanism of S_N2 reaction of (S)-2-bromobutane with sodium azide.
 - ii) P-Nitrophenol is more acidic than phenol - Explain.
 - iii) Ketones are less reactive than aldehyde towards nucleophilic addition - Explain.
- B) Attempt **any 2** of the following : 4
- i) Acetylene reacts with water in presence of $H_2SO_4 / HgSO_4$ to form Acetaldehyde - Explain.
 - ii) Which is good nucleophile in each pair ? Why ?
 - a) CH_3O^\ominus and CH_3OH
 - b) $ph - NH_2$ and NH_3
 - iii) Explain the mechanism when 1-pentene reacts with Oxymercuration-demercuration.
3. Attempt **any 2** of the following : 10
- i) What is resonance effect ? Write the conditions necessary for resonance. Explain resonating structures for Benzaldehyde or Anisole.
 - ii) What is E_2 mechanism ? Discuss evidences for E_2 mechanism.
 - iii) Draw all possible chair conformations of 1, 4-dimethyl cyclohexane and comment on their stability and optical activity.
4. A) i) Discuss the mechanism of hydrobromination in 2-methyl-2-butene. 3
- ii) Discuss the mechanism of Cannizzaro with formaldehyde. 3
- OR
- A) i) What is S_N2 reaction ? Discuss the stereochemistry of S_N2 reaction with suitable example. 4
- ii) Predict the all possible products of S_N1 reaction by specifying stereochemistry 2





B) Predict the product with justification :

4



OR

B) Write notes on :

- i) Saytzeff's elimination
- ii) Halogenation of alkene.



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
CHEMISTRY (Paper – VI) (Elective – I)
CH-336 (A) : Nuclear Chemistry
(2008 Pattern) (New Course)

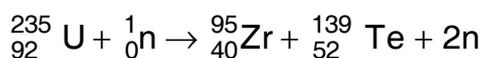
Time : 2 Hours

Max. Marks : 40

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

1. Answer the following : 10

- a) Define Isotopes with examples.
- b) What is mass defect ? Give its relation with binding energy.
- c) Give one similarity between a liquid drop and compound nucleus.
- d) State semiempirical mass equation.
- e) What is the range of α -particle ? What is the range of α -particle in air ?
- f) What are the photo nuclear reaction ?
- g) Half life of a nuclide is 15 hours calculate the decay constant.
- h) Write the names of two α -active nuclides.
- i) The nuclear reaction :



is the best example of _____

- a) Photo nuclear reaction
- b) Radiative capture
- c) Nuclear Fission
- d) Transmutation
- j) State limitations of liquid drop model.

P.T.O.



2. A) Attempt **any two** of the following : 6
- a) Write short notes on Geiger-Nuttal Law.
 - b) Discuss stability of nuclides on the basis of their N/Z ratio.
 - c) Explain thermonuclear reactions.
- B) Answer **any two** of the following : 4
- a) Calculate the average Binding energy of $^{16}_8\text{O}$ atom.
 Given : mass of H = 1.0078 amu.
 mass of n = 1.0087 amu.
 mass of $^{16}_8\text{O}$ = 15.9949 amu.
 - b) Explain the observed periodicity in nuclear properties in the light of Nuclear shell model.
 - c) Complete the following Nuclear reactions.
 - a) + $^1_0\text{n} \rightarrow ^{11}_5\text{B} + ^4_2\text{He}$
 - b) $^{35}_{17}\text{Cl} + ^1_0\text{n} \rightarrow - + \text{P}$.
3. Answer **any two** of the following : 10
- a) What are merits and demerits of shell model ?
 - b) Explain elastic and inelastic scattering in nuclear reactions ?
 - c) Explain different types of radioactive decay processes with suitable examples.
4. A) Discuss the compound nucleus theory in detail giving its postulates. 6
- OR
- A) Discuss liquid drop model in detail giving its postulates. 6
- B) What is the half life period of ^{57}Ni in hours if its sample gave with G.M. Counter activity 1857 cpm at a certain time and 875 cpm exactly after 180 minutes. 4
- OR
- B) Write a short note on Auger effect. 4
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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
CHEMISTRY (Paper – VI)
CH-336 (B) : Polymer Chemistry (Elective – I)
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

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

1. Answer the following :

10

- i) Define the term – polymer.
- ii) Cellulose is the synthetic polymer. State whether the statement is true or false and rewrite the statement.
- iii) Write the IUPAC name of $\text{Et}_2\text{Me.SiOH}$.
- iv) Define the term – “fillers”.
- v) Draw the structure of ‘poly(1-phenyl) ethylene.
- vi) The process of vulcanization was invented by _____
- vii) Calculate the molecular weight of polyvinylchloride whose D.P. is 500.
- viii) Write two important applications of Nylon-66.
- ix) Explain the term : ‘thermoplastics’.
- x) Draw the structures of following monomers :
 - a) Acrylonitrile
 - b) Styrene.

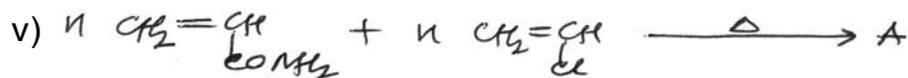
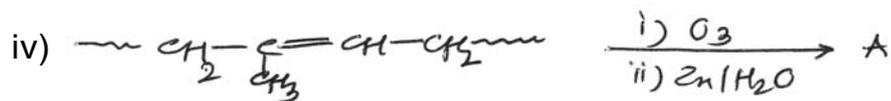
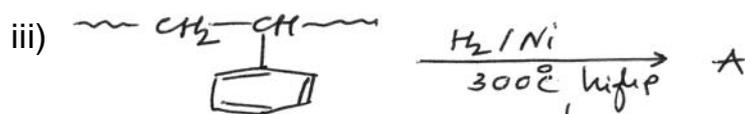
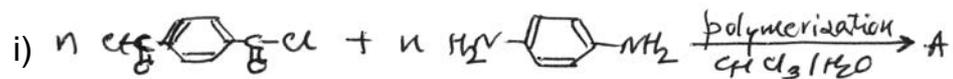


2. A) Explain the following (**any three**) : 6
- i) Frying pans are often coated with teflon.
 - ii) Antioxidants are added during polymer processing.
 - iii) Modern age is the age of polymers.
 - iv) Molecular weight of polymer is always expressed as an average.
- B) How will you differentiate between the following (**any 2**) : 4
- i) Plastics and fibres.
 - ii) Initiators and inhibitors.
 - iii) Organic and Inorganic polymers.
3. Answer **any two** of the following : 10
- i) Discuss in detail the emulsion polymerization.
 - ii) What is meant by chain polymerisation ? Give a full account of free radical polymerization with suitable examples.
 - iii) Write a note on : "Reinforcement".
4. A) Attempt **any two** of the following : 6
- i) A basket of pears contains sets of A, B, C and D with their numbers and weights as shown below :
Set A, 100 pears with weight of each pear 100 g
Set B, 120 pears with weight of each pear 120 g
Set C, 150 pears with weight of each pear 150 g
Set D, 180 pears with weight of each pear 130 g
Calculate the number average (\bar{M}_n) molecular weight of pears.
 - ii) Write a note on : Elasticity in polymeric materials.
 - iii) Give the brief account of 'cure reactions'.



B) Complete the following polymer reactions (any four) :

4





Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
CHEMISTRY (Paper – VI)
CH: 336 (C) : Introduction to Biochemistry and Molecular Biology
(New) (2008 Pattern) (Elective – I)

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.**

I. Answer the following : **10**

- 1) Name one sulphur containing amino acid.
- 2) List out two functions of cell membrane.
- 3) Give the structure of one unsaturated fatty acid.
- 4) What are anomers ? Give examples.
- 5) What are coenzyme forms of Niacin ?
- 6) Define mutarotation.
- 7) Name two hormones of anterior pituitary.
- 8) Define K_m .
- 9) List out the biomolecules that form cell membrane.
- 10) What is Sanger's reagent ? Give its use.

II. A) Attempt **any two** : **6**

- 1) List out different functions of proteins with examples.
- 2) Write note on rancidity of lipids.
- 3) Define peptide bond and list out any four features of peptide bond.

B) Write the structures of **any two** of the following : **4**

- 1) Serine cephalin
- 2) Lactose
- 3) Ala-ser-val.



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

- 1) Discuss the classification of Carbohydrates with suitable examples.
- 2) Describe the distinguishing features of a prokaryotic and eukaryotic cell, with a neat diagram.
- 3) Explain the principle, procedure and applications of Gel filtration.

IV. Answer the following : **6**

- 1) Elaborate on the competitive, noncompetitive and uncompetitive inhibition of enzymes with suitable examples.

OR

- 1) Explain the primary, secondary and tertiary structure of proteins.
- 2) Write note on source, biological functions and deficiency disorder of Vitamin A. **4**

OR

- 2) Write note on dialysis.
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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
CHEMISTRY (Paper – VI) (Elective – I)
CH:336 (D) : Environmental Chemistry
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

- Instructions:** i) **All** questions carry **equal** marks.
ii) **All** questions are **compulsory**.
iii) **Neat** diagrams must be drawn **wherever** necessary.

1. Answer the following in short : 10
- i) Define Threshold Limit Value (T.L.V.)
 - ii) What is Chemical Oxygen Demand (C.O.D.) ?
 - iii) What is the range of altitude for mesosphere ?
 - iv) Define pH.
 - v) What is Aerosol ?
 - vi) Explain the term Eutrophication.
 - vii) Explain the term Total Organic Carbon (T.O.C.)
 - viii) What is meant by Albedo ?
 - ix) Name any two toxic heavy metals.
 - x) Define Erosion.
2. a) Attempt **any two** of the following : 6
- i) Discuss the chemistry of Nitrogen oxides in atmosphere.
 - ii) Explain the term Acid Rain.
 - iii) Explain the stratosphere layer in atmosphere.
- b) Write short note on **(any two)** : 4
- i) Stratification of water body.
 - ii) TCOD accident.
 - iii) Green house gases.



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

- i) Describe the chemical speciation of Mercury.
- ii) Give an account of microbially mediated aquatic reactions involving Nitrogen transformations.
- iii) Describe the source and effect of radioactivity in atmosphere.

4. a) Discuss in detail the various segments of the environment. **6**

OR

a) Describe any one method of estimation of dissolved oxygen in water.

b) Write short note (**any one**) : **4**

- i) Volcanoes
 - ii) Chlorine chemistry in atmosphere.
-



T.Y. B.Sc. (Semester – III) Examination, 2012
CHEMISTRY (Paper – VI) (Elective – 1)
CH:336 (E) : Agriculture Chemistry
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

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

1. Answer the following : 10
- a) Define 'soil solution'.
 - b) Draw Pryanishnikov triangle.
 - c) Define particle density.
 - d) What is calcareous soil ?
 - e) What is nitrification ?
 - f) What is F.Y.M. ?
 - g) What are pesticides ?
 - h) What is Bordeaux mixture ?
 - i) What are mixed fertilizers ?
 - j) What is sodium adsorption ratio ?
2. A) Answer **any two** : 6
- 1) What is effect of lime on acidic soil ?
 - 2) What are fungicides ? Give their classification.
 - 3) Give deficiency symptoms of calcium in plants.
- B) Attempt **any two** : 4
- 1) Write a note on saline soils.
 - 2) What is the role of phosphorous in the plants ?
 - 3) Give the classification of herbicides on the basis of mode of action.



3. Attempt **any two** : 10
- A) Describe organic component of the soil.
 - B) Describe the effect of environmental conditions on nutrient uptake.
 - C) Discuss about green manuring.
4. A) Answer **any two** : 6
- 1) Discuss ion exchange reactions in soil.
 - 2) Discuss sources of water.
 - 3) What is the role of magnesium in plants ?
- B) Attempt **any two** : 4
- 1) What are the objectives of agriculture chemistry ?
 - 2) Discuss the method of expression and the quality of irrigation water.
 - 3) Give classification of pest control measures.
-



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
BOTANY (Paper – III)
BO-333 : Angiosperms and Evolution
(New Course) (2008 Pattern)

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 Artificial system of classification.
 - b) Name type of inflorescence in family Magnoliaceae.
 - c) Give floral formula of family Lamiaceae.
 - d) Give any two diagnostic characters of family papaveraceae.
 - e) Enlist any two examples of family Orchidaceae.
 - f) Write any two similarities of Bennettitales with angiosperms.
 - g) Give standard size of herbarium sheet.
 - h) Enlist two endemic plants of Maharashtra.
 - i) Where is office of Western circle of BSI.
 - j) Write any one major contribution of J.D. Hooker.

2. Answer **any two** of the following : 10
 - a) Give diagnostic characters of Nyctaginaceae with two examples.
 - b) Explain the origin of angiosperms with respect to time and place.
 - c) Explain the criteria for collecting plant specimens for Herbarium.

3. Write short notes on **any two** of the following : 10
 - a) Merits of Hutchinson's system.
 - b) Phytogeographical regions of India.
 - c) Pseudoendemism.

4. What is speciation ? Discuss allopatric and sympatric speciation. 10

OR

 4. Give diagnostic characters, floral formula and floral diagram of family papilionaceae and cannaceae.



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
BOTANY (Paper – IV)
BO – 334 : Genetics and Plant Breeding
(New Course) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions: i) **All questions are compulsory.**
ii) Figures to the **right** indicate **full** marks.
iii) Draw **neat** labelled diagrams **wherever** necessary.

1. Answer the following : 10
- a) What is genetics ?
 - b) Define alleles.
 - c) What is genome ?
 - d) Define linkage.
 - e) What are induced mutations ?
 - f) Define nullisomics.
 - g) What is test cross ?
 - h) Define plant breeding.
 - i) What is hybrid vigour ?
 - j) Define pureline.
2. Answer **any two** of the following : 10
- a) Explain dihybrid cross with a suitable example.
 - b) What is quantitative inheritance ? Explain inheritance of cob length character in maize.
 - c) Explain the mass selection method of crop improvement.

P.T.O.



3. Write notes on (**any two**) : **10**
- a) Complementary gene interaction (9 : 7 ratio).
 - b) Sex-linked inheritance in Drosophila.
 - c) Advantages of plant introduction.
4. What is polyploidy ? Explain origin and effects of autopolyploidy. **10**

OR

What is plant hybridization ? Explain various steps involved in the hybridization procedure.



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Seat
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T.Y. B.Sc. (Semester – III) Examination, 2012
BOTANY (Paper – V)
BO – 335 : Biometry and Computer Applications
(2008 Pattern) (New Course)

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 population ?
 - b) What is continuous variable ?
 - c) Enlist any two types of correlation.
 - d) What is an independent event ?
 - e) Define null hypothesis.
 - f) Enlist any two output devices.
 - g) Write an application of photoshop software.
 - h) What is ROM ?
 - i) What is modem ?
 - j) What is e-mail ?
2. Attempt **any two** of the following : 10
- a) Give scope of Biometry.
 - b) Explain Poisson distribution.
 - c) Give a brief account of primary memory storage devices.

P.T.O.



3. Write short notes on **any two** of the following : **10**

a) Chi-square test

b) Paint brush

c) Topologies of LAN.

4. What is meant by dispersion ? Write an account on any two measures of dispersion. **10**

OR

What is MS-Excel ? Write about important features of MS-Excel.



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
BOTANY (Paper – VI)
BO-336 : Cell Biology and Seed Technology
(2008 Pattern)

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 genome ?
 - b) Give two functions of lysosomes.
 - c) Write any two properties of cytoplasmic matrix.
 - d) Give any two functions of golgi bodies.
 - e) What is phagocytosis ?
 - f) What are glyoxysomes ?
 - g) Define satellite.
 - h) Name any two equipments used for seed sampling.
 - i) Define seed processing.
 - j) What is seed marketing ?
2. Answer **any two** of the following : 10
- a) What is endoplasmic reticulum ? Describe rough endoplasmic reticulum.
 - b) Differentiate between Prokaryotic and Eukaryotic cells.
 - c) Dehumidification method for seed storage.

P.T.O.



3. Write short notes on **any two** of the following : **10**

a) Ultrastructure of chloroplast.

b) Significance of mitosis.

c) Duties of seed inspector.

4. Describe ultrastructure of Mitochondria. Add a note on its functions. **10**

OR

4. Describe stages of seed production. **10**



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
ZOOLOGY (Paper – II)
ZY – 332 : Mammalians Histology
(2008 Pattern) (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 **right** indicate **full** marks.

1. Attempt the following : **10**
- 1) Define tissue.
 - 2) What is dentine ?
 - 3) State function of Brunner's gland.
 - 4) Mention the functions of Islets of Langerhans.
 - 5) What is glomerulus ?
 - 6) What is corpus luteum ?
 - 7) State the names of hormones of Adrenal medulla.
 - 8) What are Kupffer's cells ?
 - 9) State the function of sebaceous gland.
 - 10) Name the layers of wall of vein.
2. Attempt **any two** of the following : **10**
- i) Describe the histological structure of seminiferous tubule.
 - ii) Describe histological structure of pituitary.
 - iii) Describe histological structure of tastebud.

P.T.O.



3. Write notes on **any two** of the following : **10**
- a) Sketch and label T.S. of Trachea
 - b) Stratified epithelium
 - c) Histology of Pars-distalis
 - d) Histochemical demonstration of carbohydrates.
4. Explain Histological structure of liver. **10**

OR

Describe histological structure of stomach.



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Seat
No.

T.Y. B.Sc. (Semester – III) Examination, 2012
ZOOLOGY (Paper – V) (Ele. – I)
ZY – 335(a) : General Pathology (New Course)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) **All** questions are **compulsory**.
ii) Neat labelled diagram must be drawn **wherever** necessary.
iii) Figures to the **right** indicate **full** marks.

1. Attempt the following : 10
- 1) What is biopsy ?
 - 2) Define clinical pathology.
 - 3) Describe the term aetiology.
 - 4) Explain dystrophic calcification in brief.
 - 5) Define necrosis.
 - 6) What is infarction ?
 - 7) Define benign tumour.
 - 8) Name the enzyme essential for melanin synthesis.
 - 9) Describe the effect of clostridium Welchii.
 - 10) Define regeneration.
2. Attempt **any two** of the following : 10
- i) Describe importance of CSF examination.
 - ii) Describe characters of malignant tumours.
 - iii) Explain amyloid degeneration.

P.T.O.



3. Write notes on **any two** of the following : **10**

- a) Primary healing
- b) Light microscopic changes in necrosis
- c) Tuberculosis
- d) Gangrene.

4. What is inflammation ? Describe various vascular changes taking place during inflammation. **10**

OR

What is hyperamia ? Explain the causes and effects of hyperamia.



**T.Y. B.Sc. (Semester – III) Examination, 2012
ZOOLOGY (Paper – V) (Ele. – I)
ZY – 335(b) : Basic Entomology (New Course)
(2008 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 **right** indicate **full** marks.*

1. Attempt the following : **10**
- 1) Define entomology.
 - 2) Define hygrometers.
 - 3) Name any two pregenital appendages.
 - 4) What is epicranium ?
 - 5) Name any two significance of sound production.
 - 6) What is elytra ?
 - 7) Name any two cuticular appendages.
 - 8) Define pheromone.
 - 9) Define hemimetabolous development.
 - 10) Explain hypognathous type of head.
2. Attempt **any two** of the following : **10**
- I) Structure of sound producing organ in cicada.
 - II) Hormonal control of metamorphosis.
 - III) Insects as biological weapons.



3. Write notes on **any two** of the following : **10**
- a) Branches of entomology
 - b) Tactile receptors
 - c) Types of antennae in insects
 - d) Releaser and primer pheromones.
4. Describe light producing organ and mechanism of light production in insects. **10**
- OR
- Describe basic structure and types of legs in insects. **10**



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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012
ZOOLOGY (Paper – VI)
ZY – 336 Cell Biology
(2008 Pattern) (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 apoptosis.
- 2) What is nucleolus ?
- 3) Define active transport.
- 4) Define eukaryotic cell.
- 5) What is pinocytosis ?
- 6) Give function of rough endoplasmic reticulum.
- 7) Define cell adhesion.
- 8) What is nuclear sap. ?
- 9) What is centrosome ?
- 10) Define cytoskeleton.

P.T.O.



2. Attempt **any two** of the following : **10**
- i) Describe extra cellular changes during cell ageing.
 - ii) Describe process of auto phagy.
 - iii) Describe ultra structure of mitochondria.
3. Write notes on **any two** of the following : **10**
- a) Role of centriole in cell division.
 - b) Unit memb concept.
 - c) Structure of lysosome.
 - d) Microtubule.
4. Describe ultra structure of nucleus and add a note on pore complex. **10**

OR

What is cancer ? Describe various causes of cancer. **10**



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
GEOLOGY (Paper – I)
GL – 331 : Mineralogy
(2008 Pattern) (New Course)

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) Define refractive index.
 - b) What is biaxial mineral ?
 - c) What is sign of elongation ?
 - d) What is gypsum plate ?
 - e) What is optic normal ?
 - f) What is indicatrix ?
 - g) Give composition of tremolite and actinolite.
 - h) What is the composition of apatite ?
 - i) What is gypsum ?
 - j) What are precious stones ?
2. Write notes on (**any two**) : **10**
- a) Polymorphism
 - b) Physical and optical properties of felspar
 - c) Paragenesis and uses of ilmenite.

P.T.O.



3. Write notes on (**any two**) : **10**
- a) Geographical distribution and uses of mica.
 - b) Composition and alteration products of amphibole.
 - c) Physical properties and paragenesis of corundum and rutile.
4. Give silicate structure, chemical composition, physical and optical properties, paragenesis and alteration products of olivine mineral group or garnet mineral group. **10**



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
GEOLOGY (Paper – III)
GL : 333 : Sedimentary Petrology
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.
2) **All** questions carry **equal** marks.
3) 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) Physical weathering.
 - b) Maturity of sediments.
 - c) Syngenetic sedimentary ores.
 - d) Roundness of grains.
 - e) Stylolites.
 - f) Dispersal of sediments.
 - g) Placer deposits.
 - h) Mobility of oxides.
 - i) Sedimentary facies.
 - j) Biogenic sedimentary structures.
2. Write notes on (**any two**) : **10**
- a) Describe the procedure of sieve analysis. Add a note on its significance.
 - b) What are heavy minerals ? Describe the heavy mineral suites of a high grade metamorphic rocks.
 - c) Describe sedimentary basins. Give the classification of sedimentary basins.

P.T.O.



3. Answer the following (**any two**) : **10**
- a) What are primary sedimentary structures ? Describe ripple marks and mud cracks giving its significance.
 - b) Describe Dunham's classification of limestones.
 - c) Name the types of sedimentary environments. Explain physical parameters of a sedimentary environment.
4. Explain the methods of field and Laboratory studies in sedimentology. **10**

OR

4. Describe the concept of grain size. Explain the Udden-Wentworth and Krumbein phi scale. **10**



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
GEOLOGY (Paper – IV)
GL-334 : Structural Geology
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B.:** 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) Define strain.
 - b) Define flow folding.
 - c) Define hydrostatic pressure.
 - d) What is Riecke's principles ?
 - e) Define twin gliding.
 - f) Give the objectives of structural Geology.
 - g) What is dip slip fault ?
 - h) Define thrust fault.
 - i) Define 'Couple' force.
 - j) Mention factors controlling rock deformation.
2. Write notes on (**any two**) : **10**
- a) Describe shear folding.
 - b) Explain the mechanics of Normal fault.
 - c) Define primary and secondary lineations.

P.T.O.



3. Write notes on **(any two)** : **10**

a) Describe composition and Resolution of forces.

b) Describe the ultimate causes of folding.

c) Describe the concept of stress ellipsoid.

4. Explain the stages of deformation with the help of stress-strain diagram. **10**

OR

What are foliations ? Describe the different types of foliations and add a note on the origin of slaty cleavage. **10**



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
GEOLOGY (Paper – VI)
GL – 336 : Applied Geology – I
(Field Geology, Remote Sensing)
(2008 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 in **two** or **three** lines : **10**
- a) What is reconnaissance survey ?
 - b) Define geological mapping.
 - c) What is vertical aerial photograph ?
 - d) What is tip and tilt ?
 - e) What is spectral bandwidth of thermal IR ?
 - f) What is black body ?
 - g) What is meant by overlap ?
 - h) State any three applications of network analysis.
 - i) What is point feature ?
 - j) What does 'RADAR' stand for ?
2. Write notes on **any two** of following : **10**
- a) What are uses of geological surveying ?
 - b) Write an account on sub-synchronous satellites.
 - c) Explain proximity analysis.

P.T.O.



3. Write notes on **any two** of the following : **10**
- a) Describe atmospheric scattering.
 - b) Explain dendritic drainage pattern and its significance.
 - c) Explain buffer analysis.
4. Give a brief history of Remote Sensing Satellites. **10**

OR

What is aerial photography ? Discuss various factors considered while planning the aerial photography. **10**



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Seat
No.

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T.Y. B.Sc. (Semester – III) Examination, 2012
STATISTICS (Principal) (Paper – I)
ST-331 : Distribution Theory – I
(2008 Pattern) (New Course)

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. Attempt **each** of the following :

a) Choose the correct alternative in **each** of the following : **(1 each)**

i) If $X \sim \beta_2(3, 2)$ then mode of the distribution is

- A) $\frac{5}{3}$ B) $\frac{3}{2}$ C) $\frac{2}{3}$ D) $\frac{5}{2}$

ii) A random variable X has mean 1 and variance 1 then upper bound for $P[|X - 1| > 2]$ is

- A) $\frac{3}{4}$ B) $\frac{1}{8}$ C) $\frac{1}{2}$ D) $\frac{1}{4}$

iii) If $(X_1, X_2, X_3) \sim MD(n, p_1, p_2, p_3)$ then covariance between X_2 and X_3 is

- A) np_2p_3 B) $-np_2p_3$
C) $np_1p_2p_3$ D) $-np_1p_2p_3$

iv) The probability density function of the first order statistic $X_{(1)}$ of a random sample of size n drawn from distribution of random variable X is

- A) $n[1 - F(x)]^{n-1} \cdot f(x)$ B) $n[F(x)]^{n-1} \cdot f(x)$
C) $n[1 - F(x)]^{n-1}$ D) $n[F(x)]^{n-1}$

P.T.O.



b) State whether each of the following statement is **true** or **false** : **(1 each)**

i) If $X \sim W(\alpha, \beta)$ the distribution of $Y = \left(\frac{X}{\alpha}\right)^\beta$ is standard exponential.

ii) If $X \sim \beta_1(4, 3)$ then $E(1 - X)$ is given by $\frac{4}{7}$.

c) State Chebychev's inequality. **(1)**

d) Define Weibull distribution with parameters α and β . **(1)**

e) State weak law of large numbers (WLLN). **(1)**

f) Define order statistic. **(1)**

2. Attempt **any two** of the following : **(5 each)**

a) Let $X \sim W(\alpha, \beta)$. Obtain expression for mean and median of the distribution of X.

b) Six independent observations are to be made on a random variable X having following p.d.f.

$$f(x) = 2x, \quad 0 < x < 1$$

$$= 0, \quad \text{otherwise}$$

Suppose the interval (0, 1) is divided into 4 class intervals A, B, C, D of equal length. What is the probability that exactly 3 observations fall in the class A, 2 in the class B, 1 in the class C and zero in the class D ?

c) Let $X \sim \beta_2(m, n)$. Derive the expression for r th raw moment. Hence or otherwise find mean and variance.

3. Attempt **any two** of the following : **(5 each)**

a) Obtain probability density function of i th order statistic for a random sample of size n from a continuous distribution.



b) A continuous r.v. X has probability density function :

$$f(x) = \frac{1}{2\sqrt{3}}, \quad -\sqrt{3} < x < \sqrt{3}$$
$$= 0, \quad \text{otherwise}$$

Find the exact probability $P\left(|X - \mu| \geq \frac{3}{2}\sigma\right)$ and compare it with upper bound obtained by Chebychey's inequality.

c) Let X_1, X_2, \dots, X_k be k independent Poisson variates with parameters $\lambda_1, \lambda_2, \dots, \lambda_k$ respectively. Show that the conditional distribution of X_1, X_2, \dots, X_k given $X_1 + X_2 + \dots + X_k$ is multinomial.

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

a) i) Find the expectation of sample median drawn from $U(0, 1)$ distribution when sample is of size $(2n + 1)$, where n is the non-negative integer. **(7)**

ii) Let \bar{X} be the mean of a r.s. of size 100 drawn from chi square distribution with 60 d.f. Using Central Limit Theorem find $P[\bar{X} \geq 58.10]$. **(3)**

b) i) State and prove central limit theorem for i.i.d. random variables. **(5)**

ii) If $X \sim G(\alpha, \lambda_1)$ and $Y \sim G(\alpha, \lambda_2)$ and X and Y are independent variates, find distribution of $\frac{X}{X + Y}$. **(5)**



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T.Y. B.Sc. (Semester – III) Examination, 2012
GEOGRAPHY (Paper – I)
Gg.331 : Principles and Techniques of Watershed Management
(2008 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) Define watershed.
 - b) What is delineation of watershed ?
 - c) Mention any two relief aspects of watershed.
 - d) Name any two objectives of watershed management.
 - e) What is water harvesting ?
 - f) What is interception ?
 - g) Name any two linear aspects of watershed.
 - h) What is stream number ?
 - i) State the formula to calculate bifurcation ratio.
 - j) What is stream length ratio ?
2. Write short answers (**any two**) : **10**
- a) Describe any two problems in watershed management.
 - b) Describe the importance of soil studies in watershed management.
 - c) Describe types of erosion in watershed.



3. Write short notes (**any two**) : **10**
- a) Need of watershed management
 - b) Effect of Evaporation in watershed
 - c) Effect of land use in watershed.
4. Describe hydrological processes in watershed.

OR

Give an account of major principles of watershed management. **10**



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
GEOGRAPHY (Paper – IV)
Gg 334 : India-A Geographical Study
(2008 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) Name two countries with which India shares a land border to the North.
 - b) Name one region where the Pleistocene Rock systems are predominant.
 - c) What is the Khadar ?
 - d) State two predominant characteristics of the areas of Inland Drainage.
 - e) Name two states affected by Cyclones in India.
 - f) State two regions important for Coniferous forests.
 - g) Name two Regions affected by Wind Erosion in India.
 - h) State two regions important for Red Soils.
 - i) State two commercial species of Deciduous forests commonly found in India.
 - j) Mention one impact of the El Nino effect on the climate of India.

P.T.O.



2. Write short answers (**any two**) : **10**
- a) Peninsular Plateau.
 - b) The problem of Deforestation in India.
 - c) Factors influencing the Climate of India.
3. Write short notes (**any two**) : **10**
- a) The Siwalik Ranges.
 - b) Soil Conservation in India.
 - c) Locational importance of India.
4. Compare and contrast the Himalayan River Systems and the Peninsular River Systems.

OR

Discuss the Major Geological formations in India. **10**



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T.Y. B.Sc. (Semester – III) Examination, 2012
GEOGRAPHY (Paper – V)
Gg.335 : Geography of Soils – Paper – I
(2008 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) Define soil science.
 - b) What are soil horizons ?
 - c) What is soil porosity ?
 - d) Define Pedology.
 - e) What is redox potential ?
 - f) What is physical weathering ?
 - g) What are clay minerals ?
 - h) What is soil structure ?
 - i) What is pedogenesis ?
 - j) Define Intrazonal soil ?
2. Write short answers (**any two**) : **10**
- a) Distinguish between field capacity and wilting point.
 - b) What is soil temperature ?
 - c) Explain the process of chelation.

P.T.O.



3. Write short notes (**any two**) : **10**

- a) Soil structure
- b) Water holding capacity of soil
- c) Genetic structure of soil profile.

4. Describe the history of soil science and the importance of soil studies.

OR

Give an account of chemical weathering processes giving suitable examples. **10**



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
MICROBIOLOGY (Paper – I)
MB – 331 : Medical Microbiology – I
(New) (2008 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 : 5

A) Match the following :

- | A | B |
|-----------------------------|------------------------------|
| a) Trachea | i) Blood brain barrier |
| b) CNS | ii) Kupffer cells |
| c) Liver | iii) Ciliary escalators |
| d) Male reproductive system | iv) Sphincters |
| e) Urinary bladder | v) Prostate gland secretions |

B) Fill in the blanks. 3

- i) The infant of a mother suffering from gonorrhoea, may suffer from an eye infection known as _____
- ii) Pulmonary _____ is also called wool sorter's disease.
- iii) BCG vaccine is used for immunization against _____

C) State whether the following statements are **true** or **false**. 2

- i) Escherichia coli can be the cause of intestinal infections in humans.
- ii) Treponema pallidum can be easily stained.

P.T.O.



2. Attempt **any two** of the following : **10**
- a) Discuss – Epidemiology and control of Shigella infection.
 - b) Write short notes on – Widal test.
 - c) Discuss – Role of insects in transmission of disease.
3. Write short notes on **any two** of the following : **10**
- a) Classification of vibrio.
 - b) Pathogenicity of clostridium perfringens.
 - c) Cohort studies.
4. Attempt **any one** of the following : **10**
- a) Discuss – Epidemiology, laboratory diagnosis and treatment of Leprosy.
 - b) Describe various virulence factor and diseases caused by staphylococci.



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T.Y. B.Sc. (Semester – III) Examination, 2012
MICROBIOLOGY (Paper – II)
MB – 332 : Genetics and Molecular Biology – I
(2008 Pattern) (New Course)

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. Answer the following : 10

A) Match the following : 5

- | | |
|--------------------------|---|
| 1) N protein | a) Activator protein |
| 2) C II gene | b) Arabinose operon |
| 3) CAP– cAMP complex | c) Antitermination |
| 4) DNA-looping | d) Intracellular development of phages in lytic cycle |
| 5) Doermann's experiment | e) Catabolite repression |

B) Fill in the blanks : 5

- 1) The base sequence in the RNA transcript is complementary to the _____ strand.
- 2) The promotor region lies between _____ sequence and _____ sequence upstream of the start point of transcription.
- 3) The sequence of the coding strand of an RNA transcript 5'-GGCAUGCA – 3' is _____
- 4) A variation that involves an alteration in the number of chromosomes is known as _____
- 5) The phage DNA integrated with bacterial DNA is called _____

P.T.O.



2. Write short notes on (**any two**) : **10**
- a) Photoreactivation of u.v. damaged DNA.
 - b) Plaque morphology mutants of bacteriophages.
 - c) Role of ribosomes in translation.
3. Diagrammatically represent **any two** of the following : **10**
- a) Rho dependant and Rho independent termination.
 - b) Initiation of Protein synthesis.
 - c) Mechanism of tryptophan operon.
4. Answer **any one** of the following : **10**
- a) Describe the various stages of replication of bacterial DNA.
 - b) What is parasexual cycle ? With a suitable example explain its use in chromosome mapping.



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T.Y. B.Sc. (Semester – III) Examination, 2012
MICROBIOLOGY (Paper – IV)
MB 334 : Immunology – I
(New) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) **All** questions are **compulsory**.
2) **All** questions carry **equal** marks.
3) Draw **neat** labeled diagrams **wherever** necessary.

1. Do as directed :

A) Match the following :

5

- | I | II |
|-----------------------|--------------------------------------|
| 1) Incomplete antigen | a) Kinin system |
| 2) Bursa of fabricius | b) Toxin |
| 3) Skin | c) Hapten |
| 4) Soluble antigen | d) First line defense |
| 5) Complement | e) mucous associated lymphoid tissue |

B) Fill in the blanks :

5

- 1) An example of passive immunity is _____.
- 2) The serological cross-reactions are due to _____ epitopes on antigens.
- 3) _____ are antibody producing cells.
- 4) Selection of hybridoma cells is done using _____ medium.
- 5) _____ from granulocytes acts as mediators of inflammation.

2. Write short note on (**any two**) of the following :

10

- A) Applications of monoclonal antibodies.
- B) Alternative pathway of complement system.
- C) Immunoglobulin class switch.

P.T.O.



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

- A) Diagrammatically illustrate structure of IgM.
- B) Comment on 'Factors affecting immunogenicity'.
- C) Briefly describe 'Direct immunofluorescence technique'.

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

- A) Describe the structure and functions of thymus.
- B) Describe the structure and functions of lymphocytes.



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**T.Y. B.Sc. (Semester – III) Examination, 2012
MICROBIOLOGY (Paper – V) (New Course)
MB – 335 : Fermentation Technology – I
(2008 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. Do as directed : 10

A) Match the following :

- | I | II |
|-------------------------|----------------------------|
| i) Ames test | a) Sonication |
| ii) Antifoam Agent | b) Thermister |
| iii) Cell disruption | c) Patent |
| iv) Temperature control | d) Carcinogenicity testing |
| v) IPR | e) Silicone compounds |

B) What are auxotrophic mutants ?

C) Name any two chemical methods used for cell disruption.

D) Define dielectric constant.

E) Fill in the blanks :

- i) In downstream processing cell debris from fermentation broth can be removed by _____
- ii) _____ yielding strain of microorganisms should be used.

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

- a) Describe quantification of growth factors by diffusion method.
- b) Explain permeability mutants.
- c) Explain scale down as an integral part of scale up.

P.T.O.



3. Attempt **any two** of the following : **10**
- a) Describe monitoring and control of pH.
 - b) Explain pyrogen testing as a method of quality assurance.
 - c) Explain recurring expenses as an important parameter of process economics.
4. Attempt **any one** of the following : **10**
- a) Describe ion exchange chromatography with a suitable example.
 - b) Explain the methods used for media optimization.
-



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T.Y. B.Sc. (Semester – III) Examination, 2012
MICROBIOLOGY (Paper – VI)
MB-336 : Food and Dairy Microbiology
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Draw neat labeled diagram wherever necessary.*

1. Attempt the following : 5
- A) Match the following :
- | A | B |
|----------------------------|----------------------|
| a) Double Toned Milk | i) Extrinsic Factor |
| b) <u>Brucella abortus</u> | ii) 3% Fat |
| c) Water activity | iii) 1.5% Fat |
| d) Single toned Milk | iv) Intrinsic Factor |
| e) Relative Humidity | v) Milk Ring Test |
- B) Fill in the blanks : 2
- i) The full form of HACCP is _____
- ii) Pseudomonas syncyanea causes _____ defect in milk.
- C) Write the principle of MBRT test. 1
- D) What is clean Milk ? 1
- E) Name any two antibiotics used in Food preservation. 1
2. Write short note on (**any two**) : 10
- i) Principles of food preservation
- ii) Homogenised milk
- iii) Aflatoxin

P.T.O.



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

- i) Describe spoilage of canned foods.
- ii) Describe salmonella food infection with respect to sources and prevention.
- iii) Describe Ropiness of milk.

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

- a) Describe LTH and HTST methods of milk pasteurisation.
- b) Name starter cultures used in curd preparation. Describe with the help of flow chart, fermentation of milk for curd preparation.



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T.Y. B.Sc. (Semester – III) Examination, 2012
ELECTRONIC SCIENCE (Paper – III)
EL-333 : Analog Circuits Design and Applications of Linear IC's
(New) (2008 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.**

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

- a) Write the use of guarding in circuit. 1
- b) In ideal op-amp what are the values of o/p impedance and bandwidth ? 1
- c) Define aperture time in sample and hold circuit. 1
- d) What is quadrature oscillator ? 1
- e) What will be the output voltage in inverting amplifier if $R_1 = 2 \text{ k}\Omega$, $R_2 = 10 \text{ k}\Omega$, $V_i = 10 \text{ mV}$? 2
- f) Write any two application of ON-OFF controller. 2
- g) For function generator using 8038, $R = 10 \text{ k}\Omega$, $C = 0.1 \mu\text{F}$. What will be the output frequency if duty cycle is 50% ? 2
- h) List the four advantages of active filter over passive filter. 2

2. Answer **any two** of the following.

- a) What is peak detector ? Draw the circuit diagram of peak detector using OP-AMP and explain its working. 4
- b) Draw the circuit diagram of astable multivibrator using IC555. Explain its working. 4
- c) Describe log amplifier using P-N junction diode as logging element. Derive the expression for output voltage. 4

P.T.O.



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

- a) Explain the working of adjustable voltage regulator using IC LM 317. Write the expression for its output voltage. **4**
- b) Draw the circuit diagram of practical integrator. Write the designing step for it. **4**
- c) Write the concept of switched capacitor filter. Give its limitation. **4**

4. Answer **any two** of the following.

- a) What is clamper ? Draw and explain circuit diagram of clamper using op-amp in inverting configuration. **6**
- b) Draw the circuit diagram of differentiator. Derive the expression for its output voltage and explain its frequency response. **6**
- c) Explain the working of F/V converter using op-amp. Write the expression for its output voltage. Give its any two applications. **6**

OR

4. Answer the following.

- a) For VCO using IC 566, $+v = 12\text{ V}$, $R_2 = 1\text{ k}\Omega$, $R_1 = R_3 = 9\text{ k}\Omega$ and $C_1 = 0.001\mu\text{F}$. Determine the nominal frequency at the output of VCO. **4**
- b) Design second order high pass filter with low cut-off frequency 2 KHz and pass band gain 1.586. **4**
- c) Determine the time for the quasi-stable state of monostable multivibrator using op-amp IC 741. Given $R_2 = 18\text{ k}\Omega$, $R_1 = 2\text{ k}\Omega$, $C = 0.1\mu\text{F}$, $R = 3.3\text{ k}\Omega$. **4**



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T.Y. B.Sc. (Semester – III) Examination, 2012
ELECTRONIC SCIENCE (Paper – VI) (Optional) (Elective – I)
EL 336 (A) : Fiber Optics and Fiber Optics Communication
(New) (2008 Pattern)

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** the following :

- a) Define Buad rate. 1
- b) Name two most common optical sources. 1
- c) What is splicing ? 1
- d) Write an expression for optical power budget. 1
- e) What is important application areas of fiber optic communication system ? 2
- f) State any four methods used for fabrication of fiber. 2
- g) State major type of LED structure. 2
- h) “In fiber optic communication system repeaters are used”- comment. 2

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

- a) Discuss advantages of optical fiber communication system. 4
- b) What are fiber optic cable selection criteria ? 4
- c) With neat diagram explain the role of repeater in fiber optic based modems. 4

P.T.O.



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

- a) Explain External CVD method for fabrication of fiber. 4
- b) With suitable diagram explain the mechanism of detection of light in PN detector. 4
- c) Explain long haul optical fiber communication for internet working. 4

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

- a) With neat diagram explain propagation of light in optical fiber. 6
 - b) Discuss various (any three) losses in fiber. 6
 - c) Discuss coupling mechanism of source to fiber and fiber to photodetector. 6
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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
ELECTRONIC SCIENCE (Paper – VI) (optional) (Ele. – I)
EL 336 (B) : Sensors and Actuators
(New) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : 1) *All questions are compulsory.*
2) *Figures to right indicate full marks.*
3) *Draw neat diagram wherever necessary.*

1. **All subquestions are compulsory.**

- a) What is sensor ? 1
- b) State two types of electro-optical displays. 1
- c) Name any two most commonly used filters. 1
- d) State any two sensors used in automobile applications. 1
- e) What are the important properties of material by which temp. is measured ? 2
- f) What is motor ? State different types of motors. 2
- g) "Instrumentation amplifier is intended for precise low level signal amplification".
Comment. 2
- h) "Miniaturization in sensor size is possible due to modern technologies".
comment. 2

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

- a) Explain terms :
 - i) Hysteresis
 - ii) Sensitivity. 4
- b) With neat diagram explain working principle of magnetic flow meter. 4
- c) Write a note on "temp. sensors used in industry". 4



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

- a) With neat diagram explain the working of pH measurement sensor. **4**
- b) Write a short note on :
 - i) SMD
 - ii) MEMS. **4**
- c) Explain the use of optical sensors and motors in computer application. **4**

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

- a) Explain the principle, construction and working of thermocouple as temp. sensor. What are important consideration for selection of thermocouple wire materials ? **6**
- b) With neat diagram explain construction and working of stepper motor. State its two applications. **6**
- c) Discuss driver circuits for seven segment display and electromagnetic relay. **6**





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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – I)
DS-331 : Science, Technology and National Security
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences each : **16**
- 1) Define science.
 - 2) Define technology.
 - 3) Define National security.
 - 4) What is Space Science ?
 - 5) What is Material Science ?
 - 6) Define Aeronautics.
 - 7) What is meant by High Energy Physics ?
 - 8) What is meant by RMA ?
2. Answer in **8 to 10** sentences each (**any two**) : **8**
- 1) Write about the Industrial Revolution.
 - 2) Write the concept of Electronic Warfare.
 - 3) Write the strategic application of satellite.

P.T.O.



3. Write short notes on **(any two)** : **8**

- 1) Information warfare
- 2) Development trends in Defence Material
- 3) Military Application of Bio Technology.

4. Answer in **16 to 20** sentences **(any one)** : **8**

- 1) Explain about the evolution of science and its application in Theory of Flight.
- 2) Explain about the promising and new military technologies.



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES
DS – 332 : Defence Economics Paper – II
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : 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 Mixed Economy ?
 - 2) Define Threat Perception.
 - 3) Write any two functions of control of rationing.
 - 4) State the concept of Zero budget.
 - 5) What do you mean by War Potential ?
 - 6) State the meaning of Economic Mobilization for National Defence.
 - 7) What do you mean by Perspective planning ?
 - 8) What do you mean by Leadership ?

2. Answer in **8 to 10** sentences each (**any two**) : **8**
 - 1) Explain role of Military capability in Defence expenditure.
 - 2) Explain relationship between Defence and Development.
 - 3) Discuss ideology as an element of war potential.

3. Write short notes on (**any two**) : **8**
 - 1) Meaning and concept of Economic warfare.
 - 2) Structure of India's Defence budget.
 - 3) Importance of Foreign Aid in war finance.

4. Answer in **18 to 20** sentences (**any one**) : **8**
 - 1) Discuss Indian Economy : Its problems and nature.
 - 2) Explain determinants of defence expenditure.



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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES Paper – III
DS-333 : Study of Disaster
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : 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 Disaster ?
 - 2) Define Disaster management.
 - 3) Write any two functions of Disaster management.
 - 4) State the concept of manmade Disaster.
 - 5) What do you mean by Global warming ?
 - 6) State the meaning of population burden.
 - 7) What do you mean by War and Disaster ?
 - 8) State the meaning of Disaster and Terrorism.

2. Answer in **8 to 10** sentences each (**any two**) : **8**
 - 1) Explain the effects of cyclone.
 - 2) Explain types of natural Disaster.
 - 3) Discuss effects of Environmental disaster.

3. Write short notes on (**any two**) : **8**
 - 1) Chemical War and Disaster.
 - 2) Nuclear War and Disaster.
 - 3) Characteristics of Manmade Disaster.

4. Answer in **18 to 20** sentences (**any one**) : **8**
 - 1) Discuss Aim and objectives of study Disaster.
 - 2) Explain the Relationships of study between the national security and Disaster.



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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – IV)
DS-334 : Research Methodology
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : 1) ***All questions are compulsory.***

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

1. Answer in **2 to 4** sentences **each**. **16**

- 1) Define advance research.
- 2) What is meant by questionnaire method ?
- 3) Define secondary data.
- 4) Write the importance of scientific methods in research.
- 5) Write about the relations of research to development.
- 6) What do you understand by Action Research ?
- 7) What is applied research ?
- 8) What should be the basic qualifications of researcher ?

2. Answer in **8 to 10** sentences **each (any two)**. **8**

- 1) Write the role of research in Defence and Strategic Studies.
- 2) write about the characteristics of Research.
- 3) Write about the significance of Research.

P.T.O.



3. Write short notes on **(any two)** : **8**

- 1) Systematic process and Steps in Research.
- 2) Research Report.
- 3) Need of research in areas of National Security.

4. Answer in **16 to 20** sentences **(any one)**. **8**

- 1) Discuss the justifications of Hypothesis and Research design in a research.
- 2) Explain about the characteristics of questionnaire.



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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES Paper – V
DS-335 : Computer Applications in Defence Management
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : 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 Assembly Language ?
 - 2) Write the difference between CRT and LCD monitor.
 - 3) What do you mean by computer aided management ?
 - 4) State the Meaning of war gaming.
 - 5) What do you mean by Virus ?
 - 6) Define operational research.
 - 7) Write any two features of fifth generation language.
 - 8) State the meaning of Scientific Approach.

2. Answer in **8 to 10** sentences each (**any two**) : **8**
 - 1) Explain Generations of Computer.
 - 2) Discuss Data Representation and Analysis.
 - 3) Discuss Scientific Approach to Weather Forecasting.

3. Write short notes on (**any two**) : **8**
 - 1) The Computer system.
 - 2) Hardware and software.
 - 3) Scientific approach to payroll system.

4. Answer in **18 to 20** sentences (**any one**) : **8**
 - 1) Explain the Role of computer in the management of national security.
 - 2) Discuss “Computerized Battle Management System”.



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No.

T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VI) (Ele. – I) (Optional)
DS-336(A) : Indian Military System – I
(2008 Pattern)

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) Define 'Military History'.
 - 2) State any two sources of Indian Military history.
 - 3) Who was Vishwamitra ?
 - 4) Why & between whom the battle of Jhelum (Hydaspus) was fought ?
 - 5) State the weapons of Rajput period.
 - 6) Write any two merits of Rajput.
 - 7) What do you know about battle of ten King ?
 - 8) State the beginning of vedic period.
2. Answer in **8** or **10** sentences **any two** : **8**
 - 1) Explain any one source of Indian military history.
 - 2) Write in brief military education during Ramayana and Mahabharata period.
 - 3) Write in short demerits of Rajputs.
3. Write short notes on (**any two**) : **8**
 - 1) Alexander as a strategist.
 - 2) Pruthviraj Chouhan as a patriotic king.
 - 3) Kautilya as a military thinker.
4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) Discuss the conflict between Pruthviraj Chouhan and Mohammad Ghori with special reference to the battle of Tarrain.
 - 2) Highlight on views of Kautilya on defence and security affairs of the State.

P.T.O.



T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VI) (Ele. – I) (Optional)
DS-336(B) : Maratha Military System – I
(2008 Pattern)

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 : **16**
 - 1) When and where the Shivaji was born ?
 - 2) State the contemporary political powers in Maharashtra before Shivaji's birth.
 - 3) What was the aim of Shivaji for battle of Pratapgad ?
 - 4) State any four names of Shivaji's fort.
 - 5) What do you mean by "Paga" ?
 - 6) What was the basic aim of Shivaji for Karnataka campaign ?
 - 7) Where the Headquarter of Adil Shahi was situated ?
 - 8) Who was the teacher of Shivaji.
 2. Answer in **8** or **10** sentences **any two** : **8**
 - 1) Explain geographical condition of Maharashtra before Shivaji.
 - 2) What was the impact of raid on Shahistekhan on contemporary Maharashtra ?
 - 3) Write few lines on "Childhood of Shivaji".
 3. Write short notes on (**any two**) : **8**
 - 1) Shivaji's objectives of Karnataka campaign.
 - 2) Mirza Raje Jaisingh as a great strategist.
 - 3) Shivaji as a "Master of Discipline".
 4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) Analyse the battle of Pratapgad with special reference to the application of principles of war by Shivaji.
 - 2) Explain the gains for Shivaji from battle of Jawali with special reference to the strategic importance of Jawali.
-



T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VI) (Ele. – I) (Optional)
DS-336(C) : Indian Wars since Independence – I
(2008 Pattern)

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) When and where the Tashkand agreement was signed between India and Pakistan.
 - 2) Why the war took place between India and Pakistan immediately after partition ?
 - 3) During 1962 on which date India-China war took place ?
 - 4) What do you mean by ceasefire ?
 - 5) What do you mean U.N. observer ?
 - 6) Who was the P.M. of India during 1965 Indo-Pak war ?
 - 7) Which slogan was introduced by P.M.Lal B. Shastri during Indo-Pak war of 1965 ?
 - 8) What do you mean by unilateral ceasefire by Chinese of 1962 ?
2. Answer in **8** to **10** sentences **any two** : **8**
 - 1) Write in brief the causes of 1947-1948 Indo-Pak war.
 - 2) Explain in brief background of India-China war of 1962.
 - 3) How the Indo-Pak war of 1947-48 came to an end ?
3. Write short notes on (**any two**) : **8**
 - 1) Brief idea about Indo-Pak war of 1947-48.
 - 2) India-China war of 1962 : As a border war.
 - 3) Colombo proposal : Settlement of India China border dispute.
4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) "Chinese aggression during 1962 was a great shock for India" Do you agree ? Justify your answer.
 - 2) Explain the implications of Indo-Pak war of 1965 at "domestic and regional" for both the country.



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T.Y. B.Sc. (Semester – III) Examination, 2012
Defence and Strategic Studies Paper – VII (Ele – II)
DS-337 A : MILITARY SOCIOLOGY (Optional)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences **each**. **16**
 - 1) Define Culture.
 - 2) Define Military Sociology.
 - 3) What is the concept of Soldiering ?
 - 4) What is JUST WAR (*Dharma Yudha*).
 - 5) Compare the Military Values with exiting social values.
 - 6) Write about Chetwodian Motto.
 - 7) Define Ethics.
 - 8) What is Nation-Building ?
2. Answer in **8 to 10** sentences **each (any two)**: **8**
 - 1) Explain about the social concept of military.
 - 2) What is Profession of Arms ?
 - 3) Write about the strategic culture in India.
3. Write short notes on **(any two)**: **8**
 - 1) Social causes of War.
 - 2) Significance of Republic Day Parade.
 - 3) Mixed Class Army.
4. Answer in **16 to 20** sentences **(any one)**: **8**
 - 1) Explain about the need of Military Education in India.
 - 2) Justify, why Military is indispensable to a Nation-State System ?

P.T.O.



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T.Y. B.Sc. (Semester – III) Examination, 2012
Defence and Strategic Studies Paper – VII (Ele – II)
DS-337 B : DEFENCE JOURNALISM (Optional)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences **each**. **16**
 - 1) Write the duties of Defence Journalist.
 - 2) Write the type of journalism.
 - 3) Define Military Science.
 - 4) What do you understand by an all weather aircraft ?
 - 5) What do you understand by one class and mixed class army ?
 - 6) What are the functions of Training Command of IAF ?
 - 7) Elaborate AWACS and write its application.
 - 8) What do you mean by the ABC weapons ?

2. Answer in **8 to 10** sentences **each (any two)**: **8**
 - 1) Explain the functions of CCS.
 - 2) Write a report on ensuing Aerospace Commands.
 - 3) Comment on the excessive media coverage of 26/11.

3. Write short notes on **(any two)** : **8**
 - 1) Induction of Women in armed Forces.
 - 2) Role of Security Forces in Internal Security.
 - 3) Media and Military.

4. Answer in **16 to 20** sentences **(any one)** : **8**
 - 1) Write a report on NDA Passing out Parade.
 - 2) What are the ingredients to Defence Journalism ?



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T.Y. B.Sc. (Semester – III) Examination, 2012
Defence and Strategic Studies Paper – VII (Ele – II)
DS-337 C : DEFENCE PREPAREDNESS OF INDIA (I) (Optional)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences **each**. **16**
 - 1) Comment on India's naval superiority.
 - 2) Comment on HAL capacity.
 - 3) What is meant by 'Unity in Diversity' ?
 - 4) Why strong military is necessary to a nation ?
 - 5) What is Warhead ?
 - 6) Define Economic Potential.
 - 7) Introduce Aircraft Carrier.
 - 8) First and second strike capability.
2. Answer in **8 to 10** sentences **each (any two)**: **8**
 - 1) Explain about India's maritime boundaries.
 - 2) Discuss the issues between India and Pakistan.
 - 3) Explain about the role of strategic culture in defence preparedness.
3. Write short notes on **(any two)**: **8**
 - 1) Ups and Down in Indo-China relations.
 - 2) India's Land Borders.
 - 3) Status of Indian Air Force.
4. Answer in **16 to 20** sentences **(any one)**: **8**
 - 1) Discuss the ongoing debate on defence and development.
 - 2) Justify, why a sustainable economy and industrial base is indispensable to defence preparedness ?



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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VIII)
DS-338 (A) : Armed Conflict and Human Rights (Optional) (Ele. – III)
(2008 Pattern)

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 “Humanitarian studies” ?
 - 2) Define “Human Rights”.
 - 3) What do you understand by P.O.W. ?
 - 4) State the meaning of combatant.
 - 5) Define “Democracy”.
 - 6) What do you mean by International Relations ?
 - 7) What do you understand by defenceless victims ?
 - 8) State the meaning of Armed conflict.
2. Answer in **8** or **10** sentences (**any two**) : **8**
 - 1) Explain the concept of Human Rights.
 - 2) Explain the necessity of International relations.
 - 3) Write in brief concept of democracy.
3. Write short notes on (**any two**) : **8**
 - 1) Protection of civilians
 - 2) Laws of Armed conflict
 - 3) Importance of Human Rights.
4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) Explain the protection of Defenceless victims with special reference to wounded and sick soldiers.
 - 2) Explain the various theories of Human Rights.



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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VIII) (Ele. – III)
DS-338 (B) : International Organization and National Security (Optional)
(2008 Pattern)

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) When League of Nation came into existence ?
 - 2) What do you mean by International Organization ?
 - 3) Define “National Security”.
 - 4) When and between whom are Treaty of Versailles it was signed ?
 - 5) When the world war second came to an end ?
 - 6) State the date and year of formation of UNO.
 - 7) State the main bodies of League of Nation.
 - 8) What do you mean by U.N.E.P.K.F. ?

 2. Answer in **8** or **10** sentences (**any two**) : **8**
 - 1) Explain in brief the concept of International Organization.
 - 2) What were the objectives of League of Nation ?
 - 3) Write in brief any one example of Pacific Settlement by United Nations.

 3. Write short notes on (**any two**) : **8**
 - 1) General Assembly as a World Parliament.
 - 2) Treaty of Versailles.
 - 3) History of International Organization.

 4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) Explain the principal organs of UN and their functions.
 - 2) Critically assess the causes of failure of League of Nation.
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T.Y. B.Sc. (Semester – III) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VIII) (Ele. – III)
DS-338 (C) : International Law (Optional)
(2008 Pattern)

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) Define “International Law”.
 - 2) State any two sources of “International Law”.
 - 3) State any two subject of “International Law”.
 - 4) What do you mean by U.N.Charter ?
 - 5) Define “Human Rights”.
 - 6) What do you mean by “Conventions” ?
 - 7) State the meaning of ‘Treaty’.
 - 8) What do you mean by “Protocol” ?

2. Answer in **8** or **10** sentences (**any two**) : **8**
 - 1) Explain the nature of “International Law”.
 - 2) Write few lines on “The Hague Convention of 1967”.
 - 3) What do you know about “Geneva Convention of 1949” ?

3. Write short notes on (**any two**) : **8**
 - 1) Universal Declaration of I.H.R.
 - 2) U.N. Peacekeeping
 - 3) Scope of International Law.

4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) Why the use of Nuclear, chemical and biological weapons during war is strictly prohibited ? Explain with the help of conventions and treaties.
 - 2) Highlight on the historical development of International Law.



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T.Y. B.Sc. (Semester – III) Examination, 2012
ENVIRONMENTAL SCIENCES
(2008 Pattern) (New Course) (Paper – I)
ENV-331 : Terrestrial Ecosystems and Management

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**
2) *Neat and labeled 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 'physiognomy'.
 - b) Enlist the components of soil.
 - c) What are abiotic components of terrestrial ecosystem ?
 - d) Define 'Biome'.
 - e) Enlist any two terrestrial ecosystem services.
 - f) What is remote sensing ?
 - g) Give any two traditional methods of forest management.
 - h) What is species association ?
 - i) Define 'Restoration'.
 - j) What is predation ?
2. Write a short note on **(any two)** : **10**
 - a) The terrestrial biota.
 - b) Desert Biome.
 - c) Control measures of forest fire.
3. Answer **any two** from the following : **10**
 - a) Explain the sustainable management of terrestrial natural resource.
 - b) Describe the methods used for restoration of surface mined lands.
 - c) Explain the parameters used for study of terrestrial environment.
4. Attempt **any one** of the following : **10**
 - a) Write on 'Conservation and sustainable use of India's Forest Resource.
 - b) Explain Biogeocycles as a source of plant nutrients for ecosystem maintenance.



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**T.Y. B.Sc. (Semester – III) Examination, 2012
(ENVIRONMENTAL SCIENCE) (New Course) (Paper – III)
ENV 333 : Water Quality
(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Neat and labeled 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 : Water cycle.
 - b) State the difference between sewage and effluent.
 - c) Give the full form of BIS.
 - d) What is effluent ?
 - e) Define : Aquifer and mention its type.
 - f) What is meant by water crisis ?
 - g) Mention any two harmful effects of thermal pollutants.
 - h) Name any two waterborne diseases.
 - i) State the difference between Vector and Host.
 - j) Define : Epidemics.
2. Write a short note on (**any two**) : **10**
- a) Effects of water on Rocks and Minerals.
 - b) Prevention and control of communicable diseases.
 - c) Eutrophication with labelled diagram.

P.T.O.



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

- a) Give detailed classification of water pollutants based on characteristics.
- b) Explain various tests for biologically degradable organic matter.
- c) Discuss the sources and effects of lake pollution with case study.

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

- a) Explain each of three physical, chemical and Biological characteristics of water. Brief out uses of water.
- b) Describe in detail, with labelled diagram, any two secondary treatments for control of water pollution.



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T.Y. B.Sc. (Semester – III) Examination, 2012
ENVIRONMENTAL SCIENCES (Paper – V)
ENV-335 : Environmental Governance and Equity Law and Ethics
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

Instructions: 1) *All questions are compulsory.*
2) *Neat and labeled 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) Write a complete title of any pollution related Act in India.
 - b) Define environmental ethics.
 - c) What do you mean by 'Ecomark' ?
 - d) Mention any two functions of central 200 authority.
 - e) Write the statement of Public Liability Insurance Act, 1991.
 - f) Define environmental governance.
 - g) What is the meaning of 'hunting' according to Wildlife Protection Act ?
 - h) Name the authority proposed under the Biodiversity Act, 2002.
 - i) Enlist any 2 key issues of environmental dilemma.
 - j) Write the full form of UNESCO.

2. Write a short note on **(any two)** : **10**
 - a) Ammendments in the Indian Wildlife Protection Act.
 - b) Value options and aesthetics.
 - c) Motor Vehicle Act, 1988.

3. Answer **any two** from the following : **10**
 - a) Explain any 5 principles of Rio Declaration.
 - b) Elaborate on Indian Forest Policy.
 - c) What is the outcome of Stockholm conference ?

4. Attempt **any one** of the following : **10**
 - a) Discuss the significance provisions of Environment Protection Act, 1986.
 - b) What do you mean by environmental ethics in spirituality ?
 - c) Discuss various theories applied to the environment.



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T.Y. B.Sc. (Semester – III) Examination, 2012
ELECTRONIC EQUIPMENT AND MAINTENANCE
(Vocational) – (Paper – V)
Electronic Equipment Troubleshooting and Repairs
(New Course) (2008 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, calculators is allowed.**

1. Answer the following : **(3×4=12)**
- a) Answer the following : **(4×1=4)**
- i) Define the term equipment failure.
- ii) What is the purpose of triggering in CRO ?
- iii) Why is the power supply in a system most likely to become faulty ?
- iv) What are test vectors ?
- b) Comment on the following : **(2×2=4)**
- i) Troubleshooting in a system is difficult, sometimes impossible from the wiring diagram alone.
- ii) Diagnostic software is necessary for testing RAM and ROM.
- c) Answer the following : **(2×2=4)**
- i) In an inverting amplifier $R_f = 10 \text{ k}\Omega$ and $R_1 = 1 \text{ k}\Omega$. Find its gain in normal working condition. What will be the voltage at inverting input when noninverting input is at ground and at +1 volt ?
- ii) How many checks will be required in split-half method and input to output method if number of linear stages is 12 ?

P.T.O.



2. Answer **any two** of the following : **(2×4=8)**
- a) Explain common faults in different types of capacitors.
 - b) Explain the working of a series regulator circuit. What will happen if the zener diode in it is open ?
 - c) Explain the working of logic clip and logic current tracer.
3. Answer **any two** of the following : **(2×4=8)**
- a) Explain the following steps in troubleshooting.
 - Users complaint and report.
 - Identification of faulty component.
 - b) Discuss problems of troubleshooting LSI based systems.
 - c) Explain following faults in op-amp circuits.
 - Output of op-amp stuck at + Vcc
 - Closed-loop gain is low.
4. Answer **any two** of the following : **(2×6=12)**
- a) Explain troubleshooting of following faults in a CRO.
 - No trace or only a spot appears.
 - Vertical sensitivity poor.
 - Distortion in displayed waveform.
 - b) Give block diagram of DMM and explain typical faults in it.
 - c) Discuss following causes of equipment failure.
 - Poor design.
 - Production deficiencies.

OR



4. Answer the following :

(3×4=12)

- a) Discuss troubleshooting of power supply unit. What are hot and cold tests ?
- b) Find the test vector for a 3-input OR gate having fault I/O. Use path sensitizing method.
- c) i) Calculate primary to secondary turns ratio if an 8Ω load in the secondary is to be matched to the impedance of 400Ω in the primary.
ii) Explain following faults in an inductor.
 - Saturation
 - Short or partial short.



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T.Y. B.Sc. (Semester – III) Examination, 2012
SEED TECHNOLOGY (Paper – V)
Seed Pathology and Entomology (2008 Pattern) (Vocational)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat and labeled diagrams if required.*

1. Answer the following : **(1×10=10)**
- a) Give the scientific name of any one storage fungus.
 - b) Mention any two seed diseases caused by fungi.
 - c) What is seed infection ?
 - d) What is seed entomology ?
 - e) Write the scientific name of any one seed borne bacteria.
 - f) Give the scientific name of any one important pest of seeds.
 - g) Give the objective of seed treatment.
 - h) What are fungicides ?
 - i) Mention any two methods used for seed health testing.
 - j) Define pest.
2. Attempt **any two** of the following : **(5×2=10)**
- a) Give the classification of insect pest up to order level with reasons.
 - b) Write any five general characters of order orthoptera.
 - c) Write an account on seed borne viral diseases.
 - d) Explain the mechanism of seed transmission.

P.T.O.



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**T.Y. B.Sc. (Semester – III) Examination, 2012
BIOTECHNOLOGY (Paper – VI) (Vocational)
Environmental Biotechnology (Biotech – 336)
(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

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

1. Answer **each** of the following :

10

- a) Enlist the micro-organisms used in waste water treatment.
- b) Define biosorption.
- c) Define environmental biotechnology.
- d) Define ex-situ bioremediation.
- e) What are xerobiotics ? Give an example.
- f) Give two examples of biofuels.
- g) What are biopesticides ?
- h) Give the raw materials for biogas production.
- i) Define biostimulation.
- j) Define pollutants.

P.T.O.



2. Answer **any two** of the following : 10
- a) Discuss the role of biotechnology in environment protection.
 - b) Explain the process of biosorption with its applications.
 - c) Explain the applications of biotechnology to pesticide industry.
3. Write short notes on **any two** of the following : 10
- a) Biotreatment of wastes.
 - b) Ethanol production.
 - c) Bioremediation.
4. Define biofertilizers. What are the types of biofertilizers ? Explain any one type with suitable example. 10

OR

Give detail account of biotechnological applications to hazardous waste management. 10



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T.Y. B.Sc. (Semester – III) Examination, 2012
ELECTRONIC EQUIPMENT AND MAINTENANCE
(Vocational) (Paper – VI)
Electronic Instrumentation
(New Course) (2008 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, calculator is **allowed**.

1. a) Answer the following : **(4×1=4)**
i) What is a load cell ?
ii) What are self generating instruments ?
iii) What is deflection type instrument ?
iv) What is meant by traceability ?
- b) Answer the following : **(2×2=4)**
i) On its 0-100 V range a dc voltmeter has $\pm 1\%$ accuracy of fsd. For an input of 4V, find the output displayed.
ii) State the function of Q-meter.
- c) Answer the following : **(2×2=4)**
i) What are digital encoders ?
ii) Explain the term “impedance”.
2. Answer **any 2** : **(2×4=8)**
i) Discuss servo potentiometric DVM.
ii) Discuss with block diagram logic analyzer.
iii) Explain opto electrical transducer.

P.T.O.



3. Answer **any 2** : **(2×4=8)**

- i) Write a short note on absolute motion devices.
- ii) Discuss pneumatic load cell.
- iii) State any 4 applications of instrumentation system and explain any 1.

4. Answer **any 2** : **(2×6=12)**

- i) Give complete account on digital phase meter.
- ii) Discuss basic spectrum analyzer.
- iii) A voltmeter with internal resistance of $100\text{ K}\Omega$ is connected across an unknown resistance. It reads 100 V and a milliammeter connected in series reads 10 mA. Determine the apparent and actual resistance of the unknown.

OR

4. Answer the following : **(3×4=12)**

- i) What is a DSP ? State any 3 applications of DSP.
- ii) Give classification of instruments and explain automatic type of instrument.
- iii) Discuss the terms 'resolution' and 'least count'.



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T.Y. B.Sc. (Semester – III) Examination, 2012
INDUSTRIAL MICROBIOLOGY (Paper – VI) (Vocational)
VOC-IND-MIC-336 : Plant and Animal Tissue Culture
(2008 Pattern)

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 **electronic** pocket calculator is allowed.
 - 5) Assume suitable data, if **necessary**.
 - 6) **All** questions are **compulsory**.

1. Answer as directed.

10

- a) Describe : Somatic hybridogenesis.
- b) Enlist the antibiotics used in plant tissue culture medium.
- c) State True or False : Popularity of cultivating transgenic plants is increasing worldwide.
- d) Root formation is supported by high _____ to _____ ratio of hormones.
- e) Define: Totipotency.
- f) Define / Explain in one line : Primary cell culture.
- g) Mark True / False : Dulbecco's modified Eagles' minimum essential medium is used for culturing fibroblasts.
- h) Define / Explain in one line - Anchorage dependency.
- i) Mark True / False : The term organ culture implies a three-dimensional culture of disaggregated cells / tissue retaining some or all of the histological features of animal tissue *in vivo*.

P.T.O.



j) Mark the correct choice :

All of the following are examples of continuous cell line, EXCEPT :

- i) HeLa
- ii) BHK 21
- iii) L1210
- iv) MRC 9

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

- a) What is anther culture ? Comment on the importance of haploid culture in breeding.
- b) Describe Ti plasmid. Comment on the use of disarmed Ti Plasmid as a vector for transformation in plant cell.
- c) Enlist and comment on the role of various media ingredients for development of callus culture.

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

- a) Explain in brief “Plasma clot cultures”.
- b) Describe the steps in enzymatic disaggregation of cells from the explant.
- c) Explain use of cell line for cytotoxicity testing in drug development.

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

- a) Explain with suitable example the strategy employed for development of insecticide resistance in plants.
- b) Describe the hybridoma technique for production of monoclonal antibodies.



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T.Y. B.Sc. (Vocational) (Semester – III) Examination, 2012
SEED TECHNOLOGY (2008 Pattern)
Seed Farm Management, Processing and Storage (Paper – VI)

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **one** sentence **each** : **(1×10=10)**

- a) Give diagrammatic representation of seed flow during processing.
- b) What is seed storage ?
- c) Give any one factor involved in the selection of a farm business.
- d) What is general farming ?
- e) Give any one component of seed marketing.
- f) What is farm management ?
- g) Define seed treatment.
- h) What is seed bagging ?
- i) Define seed drying.
- j) Enlist seed treating equipments.

2. Answer the following (**any two**) : **(5×2=10)**

- a) Describe in detail any two methods of seed treatment.
- b) Describe in detail factors involved in the selection of a farm business.
- c) Write an account on scope of seed farm management.

P.T.O.



3. Write notes on **any two** of the following : **(5×2=10)**

- a) General Vs Specialized farming.
- b) Farm management as personal matter.
- c) Receiving the seed in seed processing unit.

4. What is seed processing ? Describe in detail any two steps involved in seed processing. **10**

OR

4. Describe in detail basic requirements for seed storage.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
MATHEMATICS (Paper – I)
MT 341 : Metric Spaces
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**
- i) Let $S = \{(x, y) \in \mathbb{R}^2 / x^2 + y^2 = 1\}$. Show that S is closed in \mathbb{R}^2 .
 - ii) Find all limit points and cluster points of Q in \mathbb{R}
 - iii) Give an example of a bounded set in a space X which is not totally bounded.
 - iv) Find all compact subsets of discrete metric space \mathbb{R}_d .
 - v) State whether true or false. Justify your answer.
“If $A \subset B \subset C$ and if A, C are connected then B is connected”.
 - vi) Define complete metric space. Show that X (0.1) is not complete w.r.t. absolute value metric.
 - vii) Show by giving an example that $B(x, r) = B(y, s)$ even though $x \neq y, r \neq s$.
2. Attempt **any two** of the following : **10**
- i) Prove that every open ball is a open set in any metric space.
 - ii) Prove that limit of a sequence in any metric space is unique.
 - iii) If $\{x_n\}$ is any Cauchy sequence in a discrete metric space then show that it is convergent.

P.T.O.



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

- i) Prove that any continuous function from a compact metric space (X, d) to any other metric space (Y, d) is bounded.
- ii) Let X be connected metric space and $g : X \rightarrow Y$ is continuous map. Prove that $g(X)$ is connected.
- iii) Show that any bounded set of \mathbb{R} is totally bounded.

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

- i) Prove that any compact subset of a metric space is closed and bounded.
- ii) a) Prove that any continuous function from a compact metric space to \mathbb{R} attains its bounds.
b) If A is connected subset of metric space X and if $A \subset B \subset \bar{A}$ then prove that B is connected.



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
MATHEMATICS (Paper – II)
MT-342 : Complex Analysis
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following :

10

i) State Cauchy-Goursat theorem.

ii) Let $f(z) = \begin{cases} \left(\frac{z}{\bar{z}}\right)^2, & z \neq 0 \\ 0, & z = 0. \end{cases}$

Show that f is discontinuous at $z = 0$.

iii) If $f(z) = z^2$, find $f'(z)$

iv) Show that $f(z) = \sin x \cosh y + i \cos x \sinh y$ is entire function.

v) Show that $\log(1 - i) = \frac{1}{2} \ln 2 - \frac{\pi}{4} i$

vi) Find $\text{Res}_{z=i} \frac{1}{z^2 + 1}$

vii) Evaluate $\int_{|z|=1} \frac{1}{z^2 + 2z + 2} dz$

P.T.O.



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

10

- i) 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

$$\lim_{z \rightarrow z_0} f(z) = w_0 \text{ if and only if}$$

$$\lim_{(x,y) \rightarrow (x_0,y_0)} u(x, y) = u_0 \text{ and } \lim_{(x,y) \rightarrow (x_0,y_0)} v(x, y) = v_0$$

- ii) If $f'(z) = 0$ everywhere in a domain D , then prove that $f(z)$ is constant function throughout D .
- iii) a) Show that $\sin(\bar{z})$ is not an analytic function of z everywhere.
b) Show that $\cosh(z + \pi i) = -\cosh z$.

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

10

- i) Using Cauchy-Residue theorem, evaluate

$$\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz, \text{ where } C \text{ is circle } |z| = 3.$$

- ii) Let f be analytic function everywhere in a domain D and C be a simple closed contour inside D . If z_0 is any interior point to C , prove that

$$f(z_0) = \frac{1}{2\pi i} \int_C \frac{f(z)}{z - z_0} dz$$

- iii) If f is analytic function over and inside a closed contour C and f' is continuous there, then prove that

$$\int_C f(z) dz = 0$$

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-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, 2012
MATHEMATICS (Paper – VI)
MT-346 : Problem Course Based on MT-344 and MT-345
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

- N.B.:** i) *All questions are compulsory.*
ii) *Figures to the right indicate full marks.*
iii) *Use separate answer book for each Section.*
iv) *Tie both the answer books together.*

SECTION – I
(Ring Theory)

1. A) Attempt **any three** of the following : **6**
- i) Is there a ring homomorphism from a ring to some ring whose Kernel is \mathbb{Z} .
 - ii) Show that $x^4 + x^3 + x^2 + x + 1$ is irreducible over \mathbb{Q} .
 - iii) Give an example of a ring in which some prime ideal is not a maximal ideal.
 - iv) Is there exists an integral domain of characteristics 6 ? If so, give an example.
- B) Attempt **any one** of the following : **4**
- i) Show that S is an ideal of $S + T$, where S is any ideal of ring R and T is any subring of R .
 - ii) Show that every homomorphic image of a commutative ring is commutative.
2. Attempt **any two** of the following : **10**
- i) Show that $\frac{R[x]}{\langle x^2 + 1 \rangle}$ is a field.
 - ii) Find all the ring homomorphisms from \mathbb{Z}_{12} to \mathbb{Z}_{30} .
 - iii) Show that an ideal $\langle p \rangle$ in principal ideal domain, is maximal if and only if p is an irreducible in D .

P.T.O.



SECTION – II

(Partial Differential Equations)

3. a) Attempt **any three** of the followings : 6

i) Find general integral of $xp + yq = z$.

ii) Show that $yzdx + xzdy + xydz = 0$ is integrable.

iii) How many integral surfaces of $zz_x + z_y = 1$ containing the initial data curve

$$C : x_0 = s, y_0 = s, z_0 = \frac{s}{2} \text{ for } 0 \leq s \leq 1. ?$$

iv) Find singular integral of $z - px - qy - p^2 - q^2 = 0$.

b) Attempt **any one** of the following : 4

i) Eliminate the arbitrary function F from $F\left(\frac{xy}{z}, \frac{x-y}{z}\right) = 0$ and find the corresponding partial differential equation and classify it.

ii) Find complete integral of $u_x^2 + u_y^2 + u_z = 1$.

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

i) Find one parameter family of solutions of $(1+yz)dx + x(z-x)dy - (1+xy)dz = 0$.

ii) Show that $p^2 + q^2 - 1 = 0$, $(p^2 + q^2)x - pz = 0$ are compatible and find one parameter family of common solutions.

iii) Let $x=x(t)$, $y=y(t)$, $z=z(t)$ is smooth and nonsingular curve in \mathbb{R}^3 then show

that $\frac{dx}{dt}, \frac{dy}{dt}, \frac{dz}{dt}$ represents direction ratios of tangent to the curve at point t .



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T.Y. B.Sc. (Semester – IV) Examination, 2012
MATHEMATICS (Paper – VII) (Elective – II)
MT-347 (F) Computational Geometry
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**

i) If a line AB having slope $\frac{1}{2}$ is transformed to the line A^*B^* , under the

transformation matrix $[T] = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, what is the slope of A^*B^* ?

ii) If a unit square is transformed by a 2×2 transformation matrix, the resulting

position vectors are $\begin{bmatrix} 0 & 0 \\ 2 & 3 \\ 8 & 4 \\ 6 & 1 \end{bmatrix}$ what was the transformation ?

iii) Write down the transformation matrix $[T]$ so that the point $[P] = [4 \ 3]$ is transformed to origin.

iv) The line with d.r.s 1,1,1 is to be made coincident with z-axis, find the rotation angles about x-axis and y-axis.

v) Find the rotation matrix about x-axis for a dimetric projection for a foreshortening factor along z-axis by $\frac{1}{2}$.

vi) Find the parametric equations of the line-segment joining two points $[A] = [1 \ 1]$ and $[B] = [2 \ 3]$.

vii) Define blending function $J_{n, i}^{(t)}$ and show that $\sum_{i=0}^n J_{n, i}^{(t)} = 1$.

P.T.O.



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

i) If the line L given by $y = mx + k$ is transformed by the transformation matrix

$$[T] = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \text{ to another line } y^*, \text{ find the } y - \text{intercept of } L^*.$$

ii) Show that for the parabola $x = y^2$ the transformation $[x \ y \ 1] \begin{bmatrix} 0 & -2 & 2 \\ -2 & 2 & -2 \\ 1 & 0 & 1 \end{bmatrix}$

yields the points that lie on a unit circle.

iii) Find the reflection of the triangle ABC about the line $x = 3$, where $[A] = [-1 \ 2]$, $[B] = [3 \ 5]$, $[C] = [2 \ -4]$.

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

i) Write the algorithm for the rotation of an object X, about an arbitrary axis in the space.

ii) Obtain the concatenated matrix to make the normal at C, to the plane passing through three points $[A] = \begin{bmatrix} 3 & 2 & \frac{3}{2} \end{bmatrix}$, $[B] = \begin{bmatrix} \frac{5}{2} & 2 & 2 \end{bmatrix}$ and $[C] = \begin{bmatrix} 3 & \frac{3}{2} & 2 \end{bmatrix}$ coincides with z-axis.

iii) Develop the dimetric projection of the object [X] if a foreshortening factor

along z-axis is 0.75 with $\theta > 0$, $\phi > 0$ where $[X] = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}$.

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

i) a) Generate uniformly spaced 5 points on the parabolic segment in the first quadrant for $3 \leq x \leq 12$ for the parabola. $y^2 = 12x$. 5

b) State any three properties of Bezier curve. Write cubic Bezier curve in matrix form if four defining polygon points B_0, B_1, B_2, B_3 are given. 5



- ii) a) Find the parametric equations of the Bezier curve with control points $[B_0] = [-1 \ -1]$, $[B_1] = [2 \ 3]$, $[B_2] = [4 \ 0]$ **6**

Find the position vectors of the points on curve corresponding to the parametric values $t = 0.1, 0.2, 0.3$.

- b) Obtain a single point perspective projection onto $z = 0$ plane of the object $[X]$ from the centre of the projection at $z = z_c = 9$ on z -axis, where **4**

$$[X] = \begin{bmatrix} 0 & 2 & -1 \\ -1 & 1 & -1 \\ 2 & 1 & 2 \\ -3 & -1 & 4 \\ 0 & 0 & 2 \\ -2 & -5 & 1 \end{bmatrix}$$





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T.Y. B.Sc. (Semester – IV) Examination, 2012
MATHEMATICS (Paper – VII) (Ele. – II)
MT – 347 (A) : Optimization Techniques
(New Course) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**

- i) Write the condition for Johnson's algorithm to be applicable in finding optimal sequencing order of processing n-jobs through 3-machines.
- ii) What is a dummy activity and when it is used ?
- iii) Distinguish between CPM and PERT.
- iv) Write the three types of replacement policies.
- v) Define two person zero sum game and fair game.
- vi) What are the methods for decision making under uncertainty ?
- vii) Find extreme values of $f(x) = 6x^5 - 4x^3 + 10$.

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

- i) A machine operator has to perform three operations turning, threading and Knurling on a number of different jobs. The time required to perform these operations (in minutes) for each job is known. Determine the order in which the jobs should be processed in order to minimize the total time required to turn out all the jobs. Also find the minimum elapsed time.

Job \ Op.	1	2	3	4	5	6
Turning	3	12	5	2	9	11
Threading	8	6	4	6	3	1
Knurling	13	14	9	12	8	13

P.T.O.



- ii) A machine costs Rs. 10,000. Its operating cost and resale values are given below :

Year	1	2	3	4	5	6	7	8
Operating cost	1000	1200	1400	1700	2000	2500	3000	3500
Resale value	6000	4000	3200	2600	2500	2400	2000	1600

Determine year at which machine should be replaced ?

- iii) Solve by Jacobian method

$$\text{Min. } f(\bar{X}) = x_1^2 + x_2^2 + x_3^2$$

Subject to

$$g_1(\bar{X}) = x_1 + x_2 + 3x_3 - 2 = 0$$

$$g_2(\bar{X}) = 5x_1 + 2x_2 + x_3 - 5 = 0$$

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

10

- i) Solve the following game graphically.

$$\begin{array}{c} \text{Player B} \\ \text{Player A} \end{array} \begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix}$$

- ii) Using dominance rules, solve the following game.

$$\begin{array}{c} \text{Player B} \\ \mathbf{b_1} \quad \mathbf{b_2} \quad \mathbf{b_3} \quad \mathbf{b_4} \\ \text{Player A} \end{array} \begin{bmatrix} \mathbf{a_1} & 5 & -10 & 9 & 0 \\ \mathbf{a_2} & 6 & 7 & 8 & 1 \\ \mathbf{a_3} & 8 & 7 & 15 & 1 \\ \mathbf{a_4} & 3 & 4 & -1 & 4 \end{bmatrix}$$



iii) Construct a network of project whose activities and their precedence relationships are given below :

Activity	A	B	C	D	E	F	G	H	I	J	K
Predecessor	-	-	-	A	B	B	C	D	E	H, I	F, G

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

10

i) A project consists of activities A, B, C, ... H, I; with following constraints

$A < D, A < E, B < F, D < F, C < G, C < H, F < I, G < I$ where $X < Y$ represent X is immediate predecessor of Y. The time in days for each activity is as follows :

Activity	A	B	C	D	E	F	G	H	I
Time	8	10	8	10	16	17	18	14	9

a) Draw a network of project.

b) Find critical path and project completion time.

c) Determine the total float and free float of each activity.

ii) The following table shows the jobs of a project along with their time estimates in days.

Job	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
Times									
t_o	3	2	6	2	5	3	1	3	4
t_m	6	5	12	5	11	6	4	9	19
t_p	9	14	30	8	17	15	7	27	28

a) Draw the project network.

b) Determine critical path and expected project completion time.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
MATHEMATICS (Paper – VII) (Ele. – II)
MT-347 (B) : Improper Integrals and Laplace Transforms
(New) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following :

10

i) Prove that $\int_1^{\infty} \frac{dx}{x^2}$ is convergent.

ii) Find Cauchy's principal value of $\int_{-\infty}^{\infty} x^3 dx$.

iii) Find $L\{t^3 + 2\sinh 5t + 10\}$.

iv) Evaluate $\frac{\sqrt{3} \sqrt{4}}{\sqrt{7}}$.

v) Find $L^{-1}\left\{\frac{6}{s^2 + 4}\right\}$.

vi) State the change of scale property for the Laplace transform.

vii) Justify whether the following statement is true or false :

$\int_{-2}^0 \frac{x^{1/2}}{1+x} dx$ is an improper integral of second kind.

P.T.O.



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

10

i) Show that the improper integral $\int_a^b \frac{dx}{(x-a)^p}$ converges if $p < 1$ and diverges for $p \geq 1$.

ii) Prove that $\int_0^2 \frac{x}{1-x} dx$ is divergent.

iii) Discuss the convergence of the series $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^\alpha}$, where $\alpha > 0$.

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

10

i) Evaluate by using the convolution theorem $L^{-1} \left\{ \frac{s}{(s^2 + a^2)^2} \right\}$.

ii) Evaluate the integral $\int_0^{\infty} t^2 e^{-4t} \cosh 2t dt$.

iii) If $L\{f''(t)\} = \tan^{-1} \left(\frac{1}{s} \right)$, $f(0) = 3$ and $f'(0) = -2$ then find $L\{f(t)\}$.

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

10

i) a) Evaluate $\int_0^{\infty} \frac{\cos 6t - \cos 4t}{t} dt$.

b) Use Laplace transform to solve $y''(t) + 9y = \cos 2t$ if $y(0) = 1$, $y\left(\frac{\pi}{2}\right) = -1$.

ii) a) If $L^{-1}\{f(s)\} = F(t)$ then show that $L^{-1} \left\{ \int_s^{\infty} f(u) du \right\} = \frac{F(t)}{t}$.

b) Solve by using Laplace transform

$$y''(t) - 3y'(t) + 2y = 4e^{2t}, y(0) = -3, y'(0) = 5.$$



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T.Y. B.Sc. (Semester – IV) Examination, 2012
MT – 347 (C) : MATHEMATICS (Paper – VII)
C – Programming – II (Ele – II)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**
 - i) Define a structure that contains two members : a 10-element character array called 'dept' and a floating point quantity called 'bal'.
 - ii) State meaning of the following declaration :
`int f(int * n, float x);`
 - iii) Declare 'x' as a pointer to array of 10 integers.
 - iv) Write a macro '(n)' to compute cube of n.
 - v) Explain in short, the use of bitwise operator XOR – ^ .
 - vi) Explain in short, the use of storage class 'register'.
 - vii) Explain the use of function : f put c.

2. Attempt **any two** of the following : **10**
 - i) Write a short note on dynamic memory allocation.
 - ii) Explain with an example the use of function : fclose.
 - iii) Write a program to copy a file to another file by using command line arguments.

3. Attempt **any two** of the following : **10**
 - i) Explain the use of storage classes : 'static' and 'auto'.
 - ii) What is a macro ? Summarise the similarities and differences between macros and functions.
 - iii) Write a program to multiply two complex numbers using structures. **P.T.O.**



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

10

- i) a) Write a note on pointer arithmetic in c.
 - b) Define a structure named point having two members of type float. Write a program to accept a, b, c and check whether the user given point lies on the line $ax + by + c = 0$.
- ii) a) Write a note on left shift and right shift operators.
 - b) Trace the output, if the program is correct.

```
#include <stdio.h>

main ()
{
    int i ;
    char season [ ] [10] = {"spring", "summer", "fall", "winter" } ;
    for (i = 0 ; i < 4 ; i ++ )
        puts *(season + i) ;
}
```



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T.Y. B.Sc. (Semester – IV) Examination, 2012
MATHEMATICS (Paper – VII)
MT – 347 (D) : Dynamics (Ele – II)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **any five** of the following : **10**

- i) Write Newton's Kinematical equations for a freely falling body.
- ii) Write the expression for velocity of particle performing S.H.M.
- iii) Find the focus of trajectory of the projectile projected from origin, making angle α with horizontal x-axis.
- iv) Let central orbit is ellipse with focus being the center of force. Find law of force.
- v) Let P and Q are two points moving with velocities u and v making angle α and β with PQ. Find magnitude of velocity of P relative to Q.
- vi) Show that the force field $\vec{F} = xi + yj + zk$ is conservative.
- vii) Show that range of projectile is maximum for a given velocity of projection, when angle of projection is 45° .

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

- i) Derive law of force for central orbit in pedal form.
- ii) Show that the path of the projectile in vacuum is a parabola.
- iii) A body, moving in a straight line OAB with S.H.M. has zero velocity when at points A and B, whose distances from O are a and b respectively and has a velocity v when half way between them. Show that the complete period is

$$\frac{\pi (b - a)}{v}.$$

P.T.O.



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

i) Let u and v are two velocity vectors making angle α between them. Find resultant of u and v with its magnitude and direction.

ii) The speed of a train increases at a constant rate α from 0 to v , then remains constant for an interval and finally decreases to 0 at a constant rate β . If l be

the total distance described, prove that total time occupied = $\frac{l}{v} + \frac{v}{2} \left(\frac{1}{\alpha} + \frac{1}{\beta} \right)$.

iii) If α be the angle between the tangents at the extremities of any arc of a parabolic path. v and v' the velocities at those extremities and u be the velocity at the vertex of the path, show that the time of describing the arc is

$\frac{v v' \sin \alpha}{gu}$. Where g is gravitational acceleration.

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

i) a) Two masses m_1 and m_2 are connected by a fine inelastic string which passes over a smooth fixed pulley. The larger mass m_2 rests on a horizontal table. m_1 is raised h feet vertically above its position of rest and let fall. Show that the time interval between m_1 leaving the table and

returning to it again is $\frac{2m_1}{m_2 - m_1} \sqrt{\frac{2h}{g}}$, where g is gravitational acceleration.

b) If the central orbit is $r^n = a^n \cos n \theta$ under a force towards the pole. Find the law of force.

ii) a) Show that the work done against the tension in stretching a light elastic string is equal to the product of its extension and the mean of the initial and final tensions.

b) State and prove work energy principle.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
PHYSICS (Paper – I)
PH – 341 : Solid State Physics
(New Course) (2008 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 (1 mark each) : **10**
- a) Define the term 'primitive cell'.
 - b) State any two uses of Hall effect.
 - c) Sketch (111) plane in simple cubic unit cell.
 - d) Determine the atomic radius (r) for face centred cubic crystal having lattice parameter (a) 4.84 \AA .
 - e) What are the advantages of powder diffraction method ?
 - f) Define the term 'Magnetization vector (\vec{M})'.
 - g) State any two applications of ferrites.
 - h) State Bloch theorem.
 - i) Define the term 'Fermi energy level'.
 - j) For simple cubic crystal what is ratio of interplaner spacing ' $d_{100} : d_{110} : d_{111}$ ' ?
2. Attempt **any two** :
- a) What is reciprocal lattice ? Show that FCC lattice is the reciprocal of the BCC lattice. **5**
 - b) What is Bragg's law ? Obtain Bragg's diffraction condition in reciprocal lattice. **5**
 - c) What is superconductor ? Describe Type-1 and Type – II superconductors. **5**

P.T.O.

3. Attempt **any two** :

- a) Find out the number of atoms per square millimeter on a plane (100) of lead whose interatomic distance is 3.499 \AA . Lead has face-centred cubic structure. **5**
- b) Find the packing fraction for FCC crystal structure. Give your comment about the structure. **5**
- c) Calculate the Hall coefficient of sodium based on free electron model. Sodium has BCC structure and the side of the cube is 4.2 \AA .
(Given : charge on an electron = $1.6 \times 10^{-19} \text{ C}$). **5**

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

- 1) State three assumption of Sommerfeld's free electron model and obtain an expression energy levels and density of states in one dimension. **8**
- 2) What is paramagnetism ? Obtain Langevin's formula for paramagnetic susceptibility. **8**

B) Attempt **any one** :

- 1) Calculate the Miller indices of a crystal plane which cut through the crystal axes at $(2a, 3b, c)$. **2**
- 2) Interplaner spacing of (200) planes in FCC aluminium is 2.02 \AA . What is the size of unit cell of the aluminium crystal. **2**



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T.Y. B.Sc. (Semester – IV) Examination, 2012
PHYSICS (Paper – IV)
PH – 344 : Nuclear Physics
(2008 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 : **10**
- a) State any two basic properties of the nucleus.
 - b) If half life period is 1600 years for a particular element. Calculate its decay constant.
 - c) What are magic numbers ?
 - d) What is nuclear fusion ?
 - e) What is compound nucleus ?
 - f) Find the total charge for a quark structure uud.
 - g) What are elementary particles ?
 - h) List different types of particle accelerators.
 - i) What is threshold voltage ?
 - j) State law of successive disintegration.
2. Attempt **any two** of the following :
- a) Obtain an expression of mean life in terms of its decay constant and half life. **5**
 - b) State and explain important features of Nuclear forces. **5**
 - c) Explain construction and working of Geiger Muller Counter. **5**

P.T.O.



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

a) Derive the expression $R = \frac{\lambda_2}{\lambda_2 - \lambda_1} \left[1 - e^{-(\lambda_2 - \lambda_1)t} \right]$ where symbols have their usual meanings. 5

b) Using the empirical formula of binding energy, find the binding energy of the nucleus ${}_{39}\text{Y}^{89}$

Given :

$$a_V = 14.1 \text{ MeV} \quad a_C = 0.59 \text{ MeV}$$

$$a_S = 13 \text{ MeV} \quad a_0 = 19.0 \text{ MeV}$$

$$a_P = -35.5 \text{ MeV for even Z even N nuclei}$$

$$= 0 \text{ for odd Z, even N or even Z, odd N nuclei}$$

$$= +35.5 \text{ MeV for odd Z odd N nuclei}$$
 5

c) The mass of deuteron (${}^2_1\text{H}$) nucleus is 2.013553 amu. Calculate the mass defect, packing fraction, binding energy and binding energy per nucleon.

Given : Mass of Proton = 1.007825 amu

and Mass of Neutron = 1.008665 amu 5

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

a) What is nuclear reactor ? Discuss the essential components of reactor and give the working principle of breeder reactor. 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_1 of the radio frequency signal. 8

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

a) State limitations of shell model. 2

b) Compute the mass of 1 Curie of C^{14} . The half life of C^{14} is 5700 years. 2



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T.Y. B.Sc. (Semester – IV) Examination, 2012
CHEMISTRY (Paper – I)
CH-341 : Physical Chemistry
(2008 Pattern) (New)

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.***

1. Answer the following :

- a) Explain the term isotones with suitable example. **10**
- b) Define the term cell constant. Give its unit.
- c) Write the cell reaction of the following cell
$$\text{Zn} | \text{Zn}^{++} || \text{H}^+ | \text{H}_2(\text{g}), \text{Pt}$$
- d) Define the term average life.
- e) What is meant by dead time of GM counter ?
- f) Define transport number of ions.
- g) Define equivalent conductance. What is its unit ?
- h) State the time independent Schrodinger wave equation and explain the terms involved in it.
- i) State de Broglies hypothesis.
- j) State any two electrodes which are reversible to H^+ ion.

P.T.O.



2. A) Answer the following (**any two**) : 6
- i) Describe moving boundary method of determine transport number of ions.
 - ii) Write briefly on : Metal-metal ion electrode with respect to its
 - a) construction
 - b) representation
 - c) working
 - iii) Define radioactivity. Explain alpha and beta decay with suitable examples.
- B) Calculate the mass defect, binding energy, and mean binding energy of ${}^4_2\text{He}$.
 Given mass of ${}^4_2\text{He} = 4.0026$ amu
 $m_{\text{H}} = 1.0078$.amu $m_{\text{n}} = 1.0086$ amu. 4
- OR
- Calculate the wave length and momentum of an α particle moving with a speed of 10^5 cms $^{-1}$. 4
3. Attempt **any two** of the following : 10
- i) Write notes on Asymmetric effect and electrophoretic effect.
 - ii) Explain the construction and working of standard hydrogen electrode and give its limitations.
 - iii) What are radioactive tracers ? How it used in study of the mechanism of chemical reactions ? Explain the answer with the help of hydrolysis of ester.
4. A) Sketch the plots for the wave function ψ versus displacement co-ordinate for the first four energy levels for particle in one dimensional box. Comment on the nature of the plots. 6
- OR
- A) Derive the Nernst equation for the following reaction.
 $a\text{A} + b\text{B} \rightleftharpoons c\text{C} + d\text{D}$ at 25°C . 6
- B) Solve **any one** of the following : 4
- i) At 25°C the equivalent conductance at infinite dilution of CH_3COONa , HCl and NaCl are 90, 425.15, and 124.9 ohm $^{-1}$ cm 2 . Calculate equivalent conductance at infinite dilution of CH_3COOH . If equivalent conductance of 0.001 N CH_3COOH is 9.23. Calculate the degree of dissociation of acetic acid at 25°C .
 - ii) Calculate the emf of the following cell at 25°C .
 $\text{Zn}|\text{Z}^{++}_{(a=0.1)}||\text{Cd}^{++}_{(a=0.05)}|\text{Cd}$.
 Given the standard oxidation potential of
 $E_{\text{Zn}}^0 = 0.76\text{V}$ and $E_{\text{Cd}}^0 = 0.44.\text{V}$.



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
CHEMISTRY (Paper – II)
CH – 342 : Inorganic Chemistry
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Actual calculations must be shown.*
4) *Marks are reserved for neat and labelled diagrams.*
5) **Use of log table and calculator is allowed.**
6) *Atomic numbers : Na (11), Mo (42).*

1. Answer the following : 10
- I) Which resin is used for separation of lanthanides in ion exchange method ?
 - II) What is the atomic number of Unn ?
 - III) Name the process by which green plants convert atmospheric CO₂ to glucose.
 - IV) Which method is used for preparation of Fe (CO)₅ ?
 - V) Which catalyst is used in hydroformylation process ?
 - VI) Arrange the univalent, bivalent and trivalent metals in decreasing order of conductivity.
 - VII) Define, 'Superconductivity'.
 - VIII) Define, 'Lattice energy'.
 - IX) What types of voids are present in closest packings ?
 - X) Write the electronic configuration in terms of t_{2g} and e_g for low spin d⁶ octahedral complex.
2. A) Write short notes on **any two** of the following : 6
- I) Nuclear fusion fuels
 - II) Chlorophyll
 - III) Frenkel defect.

P.T.O.



- B) Answer **any two** of the following : 4
- I) Distinguish between haemoglobin and myoglobin.
 - II) Count the total number of electrons in $[\text{Mo}(\text{CO})_6]$.
 - III) Calculate CFSE in terms of Dq for d^4 strong octahedral complex.
3. Answer **any two** of the following : 10
- I) Discuss band theory of sodium metal.
 - II) What is Misch metal ? How it is prepared ? Give properties and applications of Misch metal.
 - III) Discuss Wacker's process for preparation of aldehydes.
4. A) Discuss extrinsic semiconductors with suitable examples. 6
- OR
- A) Answer the following : 6
- I) Discuss Neutron Bombardment method for preparation of transuranic elements.
 - II) Write note on, 'radius ratio effect'.
- B) Univalent radius of Mg^{2+} ion is 0.82 \AA . Calculate its crystal radius. 4
- OR
- B) Answer the following : 4
- I) Show with the help of energy level diagram that CFSE for d^0 , d^5 and d^{10} configuration is zero.
 - II) 'Intake of CN^- is highly toxic to human being'; why ?



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Seat No.	
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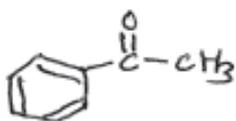
T.Y. B.Sc. (Semester – IV) Examination, 2012
CHEMISTRY (Paper – III)
CH – 343 : Organic Chemistry (New)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

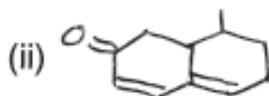
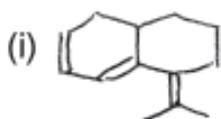
- N.B. :** i) **All questions are compulsory.**
ii) Figures to the **right** indicate **full marks.**
iii) **Draw structures and neat diagrams if necessary.**
iv) **IR, NMR and Uv spectroscopic data is given in Tables – 1, 2 and 3 respectively.**

1. Answer the following : 10
- Nitrobenzene on nitration gives m-dinitrobenzene. Why ?
 - Cyclopentadiene forms carbanion readily. Explain.
 - What is FGI ? Write with one example.
 - Explain the term Hypsochromic shift.
 - Write advantages of spectroscopic methods over chemical methods.
 - How many sets of protons in diethyl ether ?
 - Give evidence for presence of aldehyde group in citral.
 - Calculate fundamental modes of vibration of C_6H_6 .
 - How will you prove presence of benzene ring in Ephedrine ?
 - What is diazocoupling reaction ?
2. A) Attempt **any two** of the following : 6
- Write retrosynthesis and synthesis for



- Discuss mechanism of Friedel – Crafts alkylation.
- Write synthesis of propanoic acid from malonic ester.

- B) Calculate UV λ_{max} for the following : 4



OR

P.T.O.



- B) i) Write Wittig reaction with suitable example. 2
 ii) Write disconnection approach and synthon for t - butyl alcohol. 2
3. Attempt **any two** of the following : 10
- a) i) Write synthesis of citral from methyl heptenone. 3
 ii) How will you distinguish Ph-CHO and Ph-CH₂OH by IR spectroscopy ? 2
- b) i) Discuss shielding and deshielding effects with suitable example. 3
 ii) TMS is used as internal standard in NMR spectroscopy. Why ? 2
- c) i) Discuss mechanism of nitration of benzene. 3
 ii) Define chemical shift. Give formula for calculation of chemical shift. 2
4. A) Propose structures for the compounds from the following spectroscopic data. Justify your answer (**any two**) : 6
- i) Molecular formula : C₄H₈O₂
 UV λ_{max} : 280 nm
 IR : 1740 cm⁻¹
 NMR : a) triplet, 1.1 δ (3H)
 b) quartet 2.4 δ (2H)
 c) singlet 3.2 δ (3H)
- ii) Molecular formula : C₈H₈O
 UV λ_{max} : 292 nm
 IR : 1550, 1590, 1722, 2740 cm⁻¹
 NMR : a) singlet, 7.27 δ (5H)
 b) singlet, 2.80 δ (2H)
 c) singlet, 9.88 δ (1H)
- iii) Molecular formula : C₉H₁₁Br
 UV λ_{max} : 255 nm
 IR : 1500, 1600 cm⁻¹
 NMR : a) singlet, 7.2 δ (5H)
 b) doublet, 2.4 δ (2H)
 c) multiplet, 3.5 δ (1H)
 d) doublet, 1.1 δ (3H)
- B) Write notes on **any two** of the following : 4
- i) Friedel-Craft-acylation.
 ii) Crossed-aldol-condensation
 iii) Emde's degradation.
 OR
- B) i) Write applications of IR spectroscopy. 2
 ii) Give support for formation of aryne intermediate. 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 - $\text{CH}(\text{CH}_3)_2$	1380 - 1385	(s)
tert - Butyl - $\text{C}(\text{CH}_3)_3$	and 1365 - 1370	(s)
	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)
$\text{R}_2\text{C} = \text{CH}_2$ (out of plane C-H bendings)	880 - 900	(s)
cis - RCH = CHR	675 - 730	(s)
trans - RCH = CHR	960 - 975	(s)
C. Alkynyl		
$\equiv\text{C-H}$ (stretching)	- 3300	(s)
$\text{C}\equiv\text{C}$ (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. $\begin{array}{c} \\ -\text{C}-\text{O} \text{ stretch (alcohol, ether, phenol)} \\ \end{array}$	1000 - 1300	(s)
J. Nitro N = O	1550 - 1350	(s)
k. Halides		
	F	1400 - 1000 (s)
	Cl	785 - 540 (s)
	Br	< 667 (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 ₂ R	1.2 - 1.4		
3° Alkyl R ₃ CH	1.4 - 1.7		
Allylic, R ₂ C=C-CH ₂	1.6 - 1.9		
			Ester R - C(=O) - O - CH ₂ - R 4 to 4.5
Benzylic, ArCH ₂	2.2 - 2.5		
Alkyl chloride RCH ₂ Cl	3.6 - 3.8		
Alkyl bromide, RCH ₂ Br	3.4 - 3.6		
Alkyl iodide, RCH ₂ I	3.1 - 3.3		
Ether, ROCH ₂ R	3.3 - 3.9		
Alcohol, HOCH ₂ R	3.3 - 4.0		
Ketone, RC(=O)CH ₃	2.1 - 2.6	R-C(=O)-CH ₂ -	2.4 δ
		R-C(=O)-CH-	2.5 δ
Aldehyde, RCH(=O)	9.5 - 9.6		
Vinylic, R ₂ C=CH ₂	4.6 - 5.0		
Vinylic R ₂ C=CH	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*		
Carboxylic, RCOOH	10 - 13*		
Phenolic, ArOH	4.5 - 7.7*		
Amino R-NH ₂	1.0 - 5.0		

*The chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE - 3
U.V. Absorption rules for diene chromophores

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) Exocyclic 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) (202 nm 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 & higher	18 nm		β 95 nm
5) Exocyclic double bond	05 nm		



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
CHEMISTRY (Paper – IV)
CH – 344 : Analytical Chemistry (2008 Pattern) (New)

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 diagrams must be drawn wherever necessary.*

1. Answer the following : 10
- a) What is polarogram ?
 - b) What is limiting current in polarography ?
 - c) Give equation of operational definition of pH.
 - d) Define 'Migration Velocity' in electrophoresis.
 - e) Define the term 'Retention time' in Gas chromatography.
 - f) Define the term 'Retardation Factor' in gas chromatography.
 - g) Define super critical fluid chromatography.
 - h) Give principle of HPLC.
 - i) State 'Ring Rule' in mass spectrometry.
 - j) Give principle of mass spectrometry.
2. A) Answer **any two** of the following : 6
- a) Define and explain zone electrophoresis.
 - b) Give a brief account of theoretical plates in gas chromatography.
 - c) Describe construction and working of glass electrode.
- B) Answer **any two** of the following : 4
- i) Explain the qualitative applications of polarography.
 - ii) Find pH of fruit juice whose hydrogen ion concentration is 4.8×10^{-2} M.
 - iii) The molecular formula of a compound is C_7H_7NO . Calculate the number of unsaturated sites.

P.T.O.



3. Attempt **any two** of the following : **10**
- i) Discuss in brief principle underlying ion exchange chromatography. Discuss its application for (a) purification of water and (b) separation of aminoacids.
 - ii) Discuss in detail flame ionization detector and electron capture detector in gas chromatography.
 - iii) Discuss various applications of HPLC.
4. A) Describe various types of ions in mass spectrometry. **6**
- OR
- i) Give construction and working of Dropping Mercury Electrode. **3**
 - ii) Describe sample injection system in HPLC with help of diagram. **3**
- B) Calculate the diffusion current flowing through the polarographic cell containing the solution of Cd^{2+} ion having concentration 3×10^{-3} mole lit^{-1} , if the drop rate is 4 seconds and rate of falling mercury is 3 mg sec^{-1} . The diffusion coefficient of Cd^{2+} ion is $7.0 \times 10^{-6} \text{ cm}^2 \text{ sec}^{-1}$. **4**
- OR
- Calculate the average number of plates and average plate height of the column if retention time (t_R) for compounds X, Y, W, Z are 2.5, 10.7, 11.6 and 14.0 minutes respectively and width of the peak base (W) is 0, 1.3, 1.4 and 1.8 respectively. (Given height of column = 30 cm).
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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
CHEMISTRY (Paper – V)
CH-345 : Industrial Chemistry (2008 Pattern)
(New)

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 and flow sheets wherever necessary.*

1. Answer the following : 10
- 1) Explain why MgO content in cement should not exceed five percent.
 - 2) What are optical glasses ?
 - 3) What is meant by blue shift ?
 - 4) Explain the term emulsion with respect to soap.
 - 5) Define the term 'calorific value'.
 - 6) What are anaesthetics ? Give one example.
 - 7) Explain the term retarder with respect to cement.
 - 8) What is annealing of glass ?
 - 9) State advantages of detergents.
 - 10) Define the term 'Drug'.
2. A) Answer the following (**any two**) : 6
- 1) Discuss the fundamental raw materials required for manufacture of glass.
 - 2) What are surfactants ? How are they classified ?
 - 3) Explain low temperature carbonisation (LTC) of coal.

P.T.O.



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

- 1) Discuss the setting and hardening of cement.
- 2) Explain the terms chromophore and auxochrome with suitable examples.
- 3) Give the synthesis and uses of methyl orange.

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

- 1) What is shaping of glass ? Discuss the pressing and blowing processes of glass.
- 2) Describe the manufacture of Indigo dye with the help of flow sheet.
- 3) What are chemotherapeutic agents ? Explain the term antibiotics, sedatives and hypnotics with suitable examples.

4. A) Describe the manufacturing of ceramics with special reference to powder or dry pressing and extrusion forming processes. 6

OR

A) What are fuel cells ? Give advantages of fuel cell. Describe construction and working of oxygen-hydrogen fuel cell.

B) What is neat soap ? How is it processed to toilet soap ? 4

OR

B) Give the synthesis and uses of sulphanilamide and Benzocaine.



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
CHEMISTRY (Paper – VI)
CH – 346 (A) : Nuclear Chemistry (Ele. – II)
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.
2) Figures to the **right** indicate **full** marks.
3) **Draw** the diagrams **whatever** necessary.

1. Answer the following : **10**
- a) The power generated by consumption of 1 kg of Uranium is _____
i) 95 MW ii) 950 MW iii) 9.5 MW iv) 200 MW
- b) State the principle of linear accelerator.
- c) What is the amount of ^{235}U in the natural Uranium ?
- d) Which method is used to assess the volume of blood ?
- e) Show the secular equilibrium between Radium and Radon.
- f) What is the importance of reproduction factor K in the functioning of nuclear reactor ?
- g) The nuclear fuel-coal mass ratio is
i) $1:10^6$ ii) $1:10^5$ iii) $1:10^4$ iv) 1:1
- h) Give the two names of the coolant.
- i) Which are the two safety precautions taken while handling radioactive substances ?
- j) What are the advantages of semiconductor detector ?

P.T.O.



2. A) Attempt **any two** of the following : 6
- a) Explain the process of nuclear fission.
 - b) What are biological effects of radiation ?
 - c) Write a note on Szilard Chalmer's reaction.
- B) Solve **any one** of the following : 4
- a) Write a note on Breeder reactor.
 - b) Calculate the energy of the following fission :

$${}^{235}\text{U} + n \rightarrow {}^{139}\text{Xe} + {}^{95}\text{Sn} + 2n$$
 Given atomic masses :

${}^{235}\text{U} = 235.0439 \text{ amu}$	${}^{139}\text{Xe} = 138.9187 \text{ amu}$
${}^{95}\text{Sn} = 94.9190 \text{ amu}$	$n = 1.0087 \text{ amu}$
3. Answer **any two** of the following : 10
- a) Explain the principle and working of Cyclotron.
 - b) What is neutron activation analysis ? Give equation for activity produced in neutron activation analysis and explain the terms involved in it.
 - c) Write a note on natural Uranium reactor.
4. A) Define fission yield. Explain mass distribution curve for the fission fragment. 6
- OR
- A) Derive four factor formula. 6
- B) Discuss the method of preparation of the following radioisotope.
- i) Tritium
 - ii) ${}^{35}\text{S}$ (Sulphur - 35) 4
- OR
- B) Explain the radiometric titration with suitable examples. 4
-



T.Y. B.Sc. (Semester – IV) Examination, 2012
CHEMISTRY (Paper – VI)
CH – 346 (B) : Polymer Chemistry (Ele. – II)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**
iii) **Draw diagrams wherever necessary.**

1. Answer the following : **10**
- i) Define the term – polymer degradation.
 - ii) What is meant by homochain polymer ?
 - iii) Define the term – Glass transition temperature.
 - iv) Explain the term – plastic.
 - v) Write the correct structure of polybutadiene.
 - vi) Explain the term – scouring.
 - vii) Give important IR peaks of-polyacrylonitrile.
 - viii) Explain the term – polymer processing.
 - ix) Whether the following statement is true or false –
cellulose is an organic polymer.
 - x) Give two important uses of teflon.
2. A) Attempt **any two** of the following : **6**
- i) Explain the relationship between glass transition temperature and molecular weight of polymers.
 - ii) Give a brief account of geometrical isomerism in polymers.
 - iii) Write a note on thermal degradation of polymers.
- B) Answer the following (**any two**) : **4**
- i) Polyvinyl carbazole has higher glass transition temperature. Explain.
 - ii) Define the terms :
 - a) Abrasion resistance
 - b) Tear resistance.
 - iii) Write an account on factors affecting on crystallizability in polymers.



3. Attempt **any two** of the following : **10**
- i) Give detailed account of thermogravimetric analysis (TGA) of polymers.
 - ii) Describe the method of preparation, properties and uses of the following polymers.
 - a) Urea-Formaldehyde resin
 - b) Polychloroprene.
 - iii) Give a detailed account of liquid crystal polymers.
4. A) Attempt **any two** of the following : **6**
- i) Describe foaming technique in polymer technology.
 - ii) Write a note on compression moulding.
 - iii) Give a brief account of lamination technique.
- B) Explain the term – fibre spinning and give detailed account of melt-spinning process. **4**
-



T.Y. B.Sc. (Semester – IV) Examination, 2012
CHEMISTRY (Paper – VI) (Ele. – II)
CH – 346 (C) : Biochemistry (Introduction to Biochemistry and
Molecular Biology)
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

Instructions : 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*

I. Answer the following :

10

- 1) What is an Initiation Codon ?
- 2) What are restriction endonucleases ? Give example.
- 3) List out two high energy compounds.
- 4) Where does TCA cycle occur in the cell ?
- 5) How many ATP molecules are synthesised when 1 mole of palmitic acid is completely degraded by β -oxidation ?
- 6) Give one example of decarboxylation reaction of amino acid.
- 7) Define oxidative phosphorylation.
- 8) Write the structure of ATP.
- 9) Give two examples of vectors.
- 10) What are the types of RNA ?

II. A) Answer **any two** of the following :

4

- 1) Give the components of pyruvate dehydrogenase complex.
- 2) Differentiate between DNA polymerase I, II and III.
- 3) Show the central dogma of molecular biology.



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

6

- 1) Write note on fate of pyruvate in aerobic and anaerobic condition.
- 2) Differentiate between DNA and RNA.
- 3) Write the significance of transamination reactions.

III. Answer the following (**any two**) :

10

- 1) Discuss Hershey and Chase experiment and its interpretation.
- 2) Define genetic code and enlist its features.
- 3) How is glucose converted to Pyruvate ?

IV. 1) Explain β -oxidation of palmitic acid.

6

OR

1) Discuss the salient features of Watson and Crick model of DNA.

2) Write note on (**any one**) :

4

- a) Enzymes involved in DNA replication and their significance.
 - b) Clover leaf structure of tRNA.
-



T.Y. B.Sc. (Semester – IV) Examination, 2012
CHEMISTRY (Paper – VI)
CH – 346 (D) : Environmental Chemistry (Ele. – II)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : i) **All** questions carry **equal** marks.
ii) Figures to the **right** indicate **full** marks.
iii) **Neat** diagrams must be drawn **wherever** necessary.

1. Answer the following in short : **10**
- i) What is sedimentation ?
 - ii) Define incineration.
 - iii) Explain the role of glass electrode in water analysis.
 - iv) Mention any two materials used for packing of column in HPLC.
 - v) Give any two detectors used in GC.
 - vi) Define the natural resources.
 - vii) Mention the sinks for CO₂ in atmosphere.
 - viii) Ozone layer is the protective umbrella of earth, why ?
 - ix) What are the types of grass land soils ?
 - x) Mention the GWP sequence of green house gases.
2. a) Attempt **any two** of the following : **6**
- i) Explain ultrafiltration technique used for purification of water.
 - ii) Describe the mechanism of ozone depletion.
 - iii) Describe the chemiluminescence and its use in monitoring NO_x.



- b) Write short notes on **any two** of the following : **4**
- i) Solvent refined coal
 - ii) Chlorination
 - iii) Soil profile.
3. Attempt **any two** of the following : **10**
- i) Describe the ion exchange technique used in purification of industrial waste water.
 - ii) Explain the principle and working of solid state electrode.
 - iii) Describe the working of MacKereth oxygen cell in estimation dissolved oxygen (D.O.).
4. a) Explain the principle and working of equipment used in GC. **6**
- OR
- Describe in detail the tertiary waste water treatment.
- b) Write short note on **any one** : **4**
- i) Green house effect
 - ii) Thermal conductivity detector (TCD).
-



T.Y. B.Sc. (Semester – IV) Examination, 2012
CHEMISTRY (Paper – VI)
CH – 346 (E) : Dairy Chemistry (Ele. – II)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

Instructions : a) **All questions are compulsory.**
b) **Figures to the right indicate full marks.**
c) **Neat diagrams must be drawn wherever necessary.**

1. Answer the following : 10
- i) Define the term 'Real acidity' of milk.
 - ii) What are 'true' constituents of milk ?
 - iii) Write the names of methods used for cream separation.
 - iv) Define the term 'whey'.
 - v) Which diseases are caused due to deficiency of Vitamin A and vitamin B₁₂ ?
 - vi) Define the term 'adulterants'.
 - vii) How many percent fat and protein are present in cheese powder ?
 - viii) Write the formula to calculate % SNF in cream.
 - ix) List the methods used for preservation of milk.
 - x) Which are the important proteins present in the milk ?



2. A) Attempt **any two** of the following : **6**
- i) Discuss the products of 'microbial growth' of milk.
 - ii) Define term 'Butter'. Give the classification, composition food and nutritive value of butter.
 - iii) Describe the manufacturing process of Pasteurization of milk with help of flow sheet diagram.
- B) Answer **any two** of the following : **4**
- i) Comment on density and specific gravity of milk.
 - ii) What are advantages and disadvantages of sterilized milk ?
 - iii) Discuss the factor affecting fat percentage of cream.
3. A) What are carbohydrates ? How are they classified ? Give their composition, properties and structure of milk sugar. **5**
- OR
- A) Define 'market milk'. State constituents of milk and explain factors affecting the composition of milk. **5**
- B) Draw the flow sheet diagram of manufacture of fermented milk. Write the steps involved in it. Give the advantages of fermentation. **5**
- OR
- B) i) Define Ice-cream. Give the flowsheet diagram of manufacture of Ice-cream. **3**
- ii) Give the classification of Ice-cream and its commercial composition. **2**



4. a) Attempt **any two** of the following : 6

- i) Define and give composition of butter milk powder. What are the difficulties observed in the drying and storage of butter milk powder ?
- ii) Explain the importance of vitamin D in milk.
- iii) How will you test the presence of hydrogen peroxide and benzoic acid in milk sample ?

b) Write notes on **(any two)** : 4

- i) Infant milk powder
- ii) Colour and flavour of milk
- iii) Importance of packaging and storage of milk.



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T.Y.B.Sc. (Semester – IV) Examination, 2012
BOTANY (New Course)
Paper – IV : BO 344 : Plant Biotechnology
(2008 Pattern)

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 following : 10
- a) Name any two products of r-DNA technology.
 - b) What is gene bank ?
 - c) State Beer's law.
 - d) Enlist four major database links.
 - e) What are monoclonal antibodies ?
 - f) Name any two free living diazotrophs.
 - g) What are Nod genes ?
 - h) What is ICGEB ?
 - i) What is somatic hybridization ?
 - j) What is genomics ?
2. Attempt **any two** of the following : 10
- a) Describe in brief the technique of SDS-PAGE. What are its application in analysis ?
 - b) Write a short note on, Taxonomy browsers.
 - c) Write a note on, biologically synthesized vaccines.
3. Write short note on **any two** of the following : 10
- a) Somaclonal variation.
 - b) Applications of tissue culture in forestry.
 - c) Benefits of Mycorrhiza to plants.
4. Give a detail account of restriction endonucleases. 10

OR

Describe in detail the method of symbiotic nitrogen fixation.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
BOTANY
Paper – V : BO-345- Botanical Techniques
(New) (2008 Pattern)

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 ionisation effect ?
 - b) Define resolving power of microscope.
 - c) Give any two applications of X ray microanalysis.
 - d) Define sedimentation coefficient.
 - e) Write any two uses of stereoscopic microscope.
 - f) Give advantages of thin layer chromatography.
 - g) Define acetolysis.
 - h) State Beer and Lambert's law.
 - i) Define micrometry.
 - j) Mention the types of electrodes used in pH meter.
2. Attempt **any two** of the following. 10
- a) Discuss the types of micrometers used in micrometry.
 - b) What is dissecting microscope ? Give its uses.
 - c) Explain slide exposure technique used in aeropalynology.

P.T.O.



3. Write short notes on **any two** of the following : **10**
- a) Working of Spectrophotometer.
 - b) Intricacies of seeing objects through microscope.
 - c) Technique of paperchromatography.
4. What is digital imaging ? Explain new opportunities and advantages of digitization of images. **10**

OR

Describe the different glassware used in microtechnique with their uses.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012
BOTANY (Paper – VI) (2008 Pattern)
BO-346 : (Pharmacognosy)**

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
- Define active principle.
 - What is the source of Abini in Siddha system of medicine ?
 - Enlist Panchamahabhutas.
 - What is meant by Prabhav ?
 - Define stomatal index.
 - Give two advantages of microscopic study of drugs.
 - Give source of gum.
 - Mention any two medicinal uses of Cinnamon.
 - Give the plant part used in Woodfordia.
 - Who coined the term Ethnobotany ?
2. Attempt **any two** of the following : 10
- Give an account of chemical classification of crude drugs.
 - Describe Ayurvedic principles Rasa and Vipak.
 - Write an account of drug adulteration.

P.T.O.



3. Write short notes on **any two** of the following : **10**
- a) Concept of tridoshas.
 - b) Cultivation methods of crude drugs.
 - c) Ethnic societies of India and their contribution.
4. Give an account of source, cultivation method, microscopic characters, chemical constituents and medicinal uses of Asparagus. **10**

OR

Give source, microscopic characters, chemical constituents and medicinal uses of Amla. **10**



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Seat No.	
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**T.Y. B.Sc. (Semester – IV) Examination, 2012
ZOOLOGY (Paper – I) (2008 Pattern)
ZY-341 : Biotechnology (New)**

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 right indicate full marks.**

1. Attempt the following: 10
- 1) What is Northern blotting ?
 - 2) What is polyclonal antibody ?
 - 3) What are restriction enzyme ?
 - 4) Define organ culture.
 - 5) Define biotechnology.
 - 6) What is cell line ?
 - 7) What are stem cells ?
 - 8) Define cosmid.
 - 9) Give any one importance of animal tissue culture.
 - 10) What is centrifugation ?
2. Attempt **any two** of the following : 10
- i) Describe the advantages of biopesticides.
 - ii) Describe the ELISA technique.
 - iii) Write a note on transformed cell.
3. Write short notes on **any two** : 10
- a) Describe the cellfusion
 - b) Primary culture
 - c) Aquaporin
 - d) Culture media.
4. What are transgenic animal ? Write method of production of transgenic animals. 10

OR

What is hybridoma technology ? Describe the method of production of polyclonal antibodies.



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Seat No.	
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**T.Y. B.Sc. (Semester – IV) Examination, 2012
ZOOLOGY (Paper – III) (2008 Pattern)
ZY – 343 : 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. Attempt the following; 10
 - 1) Define Exon.
 - 2) What is Phage ?
 - 3) Define phosphodiester bond.
 - 4) Mention the function of enzyme gyrase.
 - 5) What is complimentary base pairing ?
 - 6) Mention the role of rho factor in transcription.
 - 7) Define hypochromacity.
 - 8) What is Okazaki fragment ?
 - 9) Mention initiation codon and amino acid coded by it.
 - 10) What is shine and dolgarno sequence ?
2. Explain **any two** of the following : 10
 - i) Describe RNA polymerase enzyme.
 - ii) Describe Harshey and Chase experiment.
 - iii) Describe nucleosome.
3. Write notes on **any two** of the following : 10
 - a) Trp-operon
 - b) Bacterial transformation
 - c) Repairing of DNA
 - d) SnRNAs
4. What is DNA replication ? Explain the different types of DNA replications.

OR

What is translation ? Describe the steps involved in translation. 10



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T.Y. B.Sc. (Semester – IV) Examination, 2012
ZOOLOGY (Paper – IV) (2008 Pattern)
ZY-344 : Organic Evolution (New)

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 **right** indicate **full** marks.

1. Attempt the following. 10
 - 1) Define race.
 - 2) Name any two apes.
 - 3) What are homologous organs ?
 - 4) Define speciation.
 - 5) What is analogous structure ?
 - 6) Name any two geographical barriers.
 - 7) In which zoogeographical realm India is included ?
 - 8) Explain isolation.
 - 9) What are prions ?
 - 10) Explain Archeozoic era.
2. Attempt **any two** of the followings. 10
 - 1) Describe Australopithecus.
 - 2) Describe Geographical evidences for evolution.
 - 3) Explain in detail geographical animal distribution.
3. Write notes on **any two** of the following. 10
 - 1) Neo Darwinism.
 - 2) Australium realm.
 - 3) Origin of primary organisms.
 - 4) Allopatric speciation.
4. Describe Darwins theory of natural selection. 10

OR

Define isolation. Explain in detail geographical and reproductive isolation mechanisms. 10



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T.Y.B.Sc. (Semester – IV) Examination, 2012
ZOOLOGY (Paper – V) (2008 Pattern)
ZY – 345(a) : Public Health and Hygiene (Elective – II)
(New)

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) Define community health.
 - 2) Enlist natural means of ventilation.
 - 3) Enlist the sources of water.
 - 4) What are condiments ?
 - 5) What is the effect of deficiency of Vit.A ?
 - 6) Define refuse.
 - 7) Explain the term communicable disease.
 - 8) Define pests.
 - 9) State the name of pathogen causes leprosy.
 - 10) Enlist natural sources of radiations.
2. Attempt **any two** of the following : 10
- 1) Describe the artificial ventilation.
 - 2) Explain the effects of tobacco.
 - 3) Explain the properties of soil.

P.T.O.



3. Write notes on **any two** : **10**
- 1) WHO and its services.
 - 2) Disposal of sewage.
 - 3) Standards of rural housing.
 - 4) Alcoholism.
4. Give an account of rapid sand filter method of water purification. **10**

OR

Explain the signs, symptoms, mode of transmission and control measures of measles. **10**



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T.Y.B.Sc. (Semester – IV) Examination, 2012
ZOOLOGY (Paper – V) (2008 Pattern)
ZY – 345 (b) : Biodiversity (Elective – II)
(New)

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 types of diversities among insects.
 - 2) Write any two examples of insects found in pond.
 - 3) State important adaptations in desert insects.
 - 4) Define the term population dynamics.
 - 5) What are pterygotan insects ?
 - 6) Write any two examples of social insects.
 - 7) What are polyphagous insects ?
 - 8) Give any two examples of parental care in insects.
 - 9) What are plant bodyguards ?
 - 10) Write any two survival strategies in insects.
2. Attempt **any two** of the following : **10**
- i) Describe seasonal variations in insect population.
 - ii) Write taxonomic characters and examples of order Lepidoptera.
 - iii) Explain social organisation in ants.



3. Write notes on **any two** : **10**
- a) Oviposition diversities in insects.
 - b) Significance of diversity in food and feeding habits in insects.
 - c) Insects as predators and parasites.
 - d) Diapause behaviour in insects.
4. Write distinguishing features, examples and significance of order Coleoptera and Hemiptera. **10**

OR

Explain important steps essential for conservation and management of insect diversity. **10**



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T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOLOGY (Paper – I)
GL-341 : Metamorphic Petrology (New)
(2008 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 in **2/3** lines. **10**

- a) Define prograde metamorphism.
- b) Define pneumatolysis.
- c) What is flaser rock ?
- d) What is lineation ?
- e) What is metamorphic facies ?
- f) What is scapolitization ?
- g) What is reekies principle ?
- h) Name any two metamorphic minerals.
- i) What is gheissose structure ?
- j) Give two textural evidences of metasomatism.

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

- a) Lower and upper limit of metamorphism.
- b) Types of thermal metamorphism.
- c) Diagrammatic representation of conditions controlling metamorphism.

P.T.O.



3. Answer **any two** of the following : **10**
- a) Lime metasomatism.
 - b) Habits of metamorphic crystals.
 - c) Diagrammatic representation of pressure-temperature conditions of different metamorphic facies.
4. What are Barrovian zones ? Describe the chlorite zone and Garnet zone in detail. **10**

OR

Describe the pressure-temperature conditions of plutonic metamorphism. Describe the Granulite, Leptynite and Leptite series of rocks.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOLOGY (2008 Pattern)
Paper – II – GL – 342 : Environmental Geology (New)

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All** questions are **compulsory**.
 - 2) **All** questions carry **equal** marks.
 - 3) Figures to the **right** indicate **full** marks.
 - 4) Neat labelled diagrams must be drawn **wherever** necessary.

1. Define/Answer the following in **2/3** lines : **10**
 - a) Biogeochemical cycle.
 - b) Flood
 - c) Hazard
 - d) Desertification
 - e) Erosion
 - f) Earthquakes
 - g) Conventional energy resources
 - h) Landslide
 - i) Types of resources
 - j) Water pollution.

2. Write notes on (**any two**) : **10**
 - a) Processes and causes of accelerated erosion.
 - b) Types of volcanic hazards.
 - c) Case history of Chernobyl disaster.

P.T.O.



3. Answer the following (**any two**) : **10**
- a) Types of water pollution, add a note on Minamata disease.
 - b) Causes and impact of coastal erosion.
 - c) Classification of natural resources.
4. What are volcanoes ? Explain the types of volcanic hazards. Add a note on prediction of volcanic activity. **10**

OR

Describe the crises faced by mankind with regards to conventional energy resources. Add a note on conservation and development of energy resources. **10**



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No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOLOGY (Paper – III)
GL-343 : Economic Geology (New)
(2008 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 in **2/3** lines. **10**
a) What is dry steam ?
b) Define the term gangue.
c) Define vug.
d) What are alluvial deposits ?
e) What is country rock ?
f) What is metasomatic replacement ?
g) Give two gold fields in Karnataka.
h) Define geothermal energy.
i) Give two important oxides of U and Th.
j) Name the four nickel bearing minerals.
2. Answer **any two** of the following : **10**
a) Mineralogy and uses of manganese deposits.
b) Mode of formation, occurrence and distribution of residual clay deposits.
c) Varieties of the fissure veins.
3. Answer **any two** of the following : **10**
a) Assam oil field.
b) Mineralogy, mode of occurrence and origin of silver deposits.
c) Gossans as guides to the hidden deposits.
4. Explain the origin and different varieties of coal. **10**

OR

Explain early and late magmatic deposits with suitable examples.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOLOGY (Paper – V)
GL 345 : Phanerozoic Stratigraphy of India and Palaeontology
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 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) Give type locality of Silurian system.
 - b) Name the Cenozoic orogeny.
 - c) What are Infratrappeans ? Give an example.
 - d) Name any two Index Fossils of Cambrian system.
 - e) What is Laterite ?
 - f) What is the age of Siwaliks ?
 - g) What is 'Barren Measures' ? Give its stratigraphic position.
 - h) Name important fossils of Mesozoic era.
 - i) Give the subdivisions of Jurassic of Kutch.
 - j) Give systematic classification of Gangamopteris.
2. Write notes on **(any two)** : **10**
- a) Causes of mass extinction.
 - b) Triassic system.
 - c) Age of Deccan Traps.

P.T.O.



3. Write notes on **(any two)** : **10**

- a) Tertiary of Assam
- b) Karewas of Kashmir
- c) Graptolites.

4. Answer the following : **10**

- a) Palaeozoic of Spiti
- b) Stratigraphy of Maharashtra.

OR

Give a detailed account of geographical distribution, Palaeoclimate, life and classification of Gondwana Supergroup.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOLOGY (Paper – VI)
GL-346 : Applied Geology – II
(Engineering Geology, Geohydrology and Prospecting)
(2008 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) Define runway aggregate.
 - b) Name types of dam.
 - c) State any two qualities of good facing stone.
 - d) Define engineering geology.
 - e) What is water table ?
 - f) What is rainwater harvesting ?
 - g) Define aquifuge.
 - h) What is gravimeter ?
 - i) What is mineralogical prospecting ?
 - j) What is torsion balance ?

2. Write notes on (**any two**) : **10**
 - a) Recharge of ground water.
 - b) Compressive strength of rocks.
 - c) Principles of geophysical prospecting.

P.T.O.



3. Write notes on **(any two)** : **10**
- a) Rainwater harvesting
 - b) Significance of geology in civil engineering.
 - c) Applications of seismic method of prospecting.
4. Explain in detail lithological and structural criteria for prospecting. **10**

OR

Enumerate different engineering properties of rocks. Explain the compressive strength, tensile strength and elasticity of rocks. **10**



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Seat No.	
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T.Y.B.Sc. (Semester – IV) Examination, 2012
STATISTICS (Principal) (Paper – I)
ST-341 : Distribution Theory – II
(2008 Pattern) (New Course)

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. Attempt **each** of the following :

a) In **each** of the following cases, choose the correct alternative : **(1 each)**

i) Let $X \sim c(\mu, \lambda)$, then median of X is

- A) λ B) $\mu + \lambda$ C) μ D) $\mu - \lambda$

ii) If $X \sim \text{LN}(0, \mu, \sigma^2)$, then standard deviation of $\log_e X$ is

- A) σ B) μ C) $\mu + \sigma$ D) $\sqrt{\mu}$

iii) If $X \sim L(3, 1)$, then third quartile of X is

- A) 3 B) $\mu + \log_e 2$ C) 1 D) $\log_e 3$

iv) Mean of Poisson distribution with parameter λ , truncated at $X = 0$ is

- A) $\lambda(1 - e^{-\lambda})^{-1}$ B) λ C) $\lambda e^{-\lambda}$ D) $e^{-\lambda}$

b) State whether **each** of the following statements is **true** or **false** : **(1 each)**

i) Laplace distribution is symmetric about zero.

ii) For a stochastic matrix, column sums need not be equal to 1.

c) i) State Chapman-Kolmogorov equation. **1**

ii) State the relationship between Cauchy distribution and t-distribution. **1**

P.T.O.



d) Define **each** of the following : **(1 each)**

- i) Finite Markov-chain.
- ii) n-step transition probability.

2. Attempt **any two** of the following : **(5 each)**

- a) Let $X \sim c(\mu, \lambda)$. Find the cumulative distribution function of X and hence obtain quartile deviation of it.
- b) Let $X \sim \text{LN}(a, \mu, \sigma^2)$. Derive r^{th} raw moment about $x = a$, hence find its variance.
- c) Let $(X, Y) \sim \text{BN}(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$. Obtain the conditional distribution of Y given $X = x$.

3. Attempt **any two** of the following : **(5 each)**

- a) Let $X \sim L(\mu, \lambda)$. Find the cumulant generating function of X and hence find 2nd, 3rd and 4th central moments.
- b) Let $X \sim B(n, p)$, truncated at $X = 0$. Find mean and variance of X .
- c) Let $X \sim N(\mu, \sigma^2)$, truncated to the left below a . State p.d.f. of the resulting distribution and obtain its mean.

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

- a) i) Obtain the distribution of $Y = X^r$ where $X \sim \text{LN}(0, 2, 1)$, $r = 2, 3, 4, \dots$

Also compute $P[X^2 > 1]$.

6

- ii) Let $X \sim L(\mu = 1, \lambda = 4)$. Find $P[|X| < 2]$ and $P[0 < X < 1]$.

4



b) i) The one-step transition probability matrix of a Markov-chain $\{X_n, n \geq 0\}$ is given by

$$P = \begin{bmatrix} 0 & 1/3 & 2/3 \\ 2/3 & 0 & 1/3 \\ 1/3 & 2/3 & 0 \end{bmatrix}$$

The initial distribution is $\pi = \{1/2, 1/4, 1/4\}$

Compute :

I) $P [X_2 = 2, X_1 = 1, X_0 = 0]$

II) $P [X_2 = 2 \mid X_1 = 1]$

III) $P [X_2 = 0 \mid X_0 = 1].$

7

ii) Let $(X, Y) \sim BN (1, 2, 1, 1, 0.5)$. Find $E (X \mid Y = 2)$ and $E (Y \mid X = 3)$.

3





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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
STATISTICS (Principal) (Paper – II)
ST – 342 : Testing of Hypotheses
(2008 Pattern)

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. Attempt **each** of the following :

a) In **each** of the following cases, choose the correct alternative : **(1 each)**

i) Probability of accepting H_0 when it is not true is

- A) Level of significance B) Size of the test
C) Power of the test D) Probability of type II error

ii) In case of $N(\mu, 1)$ distribution, the UMPCR for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu < \mu_0$ is of the form

- A) $\sum_{i=1}^n X_i < c$ B) $\sum_{i=1}^n X_i^2 > c$
C) $\sum_{i=1}^n X_i^2 < c$ D) $\sum_{i=1}^n X_i > c$

iii) Which of the following is used for testing the randomness of a sample ?

- A) Sign test B) Mann-Whitney test
C) Run test D) Kolmogorov-Smirnov test

iv) Under some regularity conditions on $f(x, \theta)$, the asymptotic distribution of the r.v. $-2 \log \lambda(x)$ is (where $\lambda(x)$ is the likelihood ratio)

- A) Normal B) t C) Chi-square D) Poisson

P.T.O.



- b) In **each** of the following cases, state whether the given statement is **true** or **false** : **(1 each)**
- In Wald's SPRT, sample size is fixed.
 - Observed level of significance is called as the p-value of the test.
- c) Define **each** of the following : **(1 each)**
- Critical region
 - Simple hypothesis.
- d) Explain **each** of the following : **(1 each)**
- A run in a sequence of symbols.
 - Power function of a test.

2. Attempt **any two** of the following : **(5 each)**

a) Construct SPRT of strength (α, β) for testing $H_0 : m = m_0$ against $H_1 : m = m_1$ ($m_1 > m_0$) for Poisson distribution with parameter m .

b) Let X be a r.v. with p.m.f. $f_0(x)$ under H_0 and $f_1(x)$ under H_1 as given below :

$X = x$:	1	2	3	4
$f_0(x)$:	0.1	0.2	0.3	0.4
$f_1(x)$:	0.4	0.3	0.2	0.1

- Find all critical regions for which the probability of the type I error is 0.4.
 - Find the critical region in (i) which has maximum power.
 - Find all critical regions for which probability of type I error is ≤ 0.4 .
 - Find the critical region in (iii) which has maximum power.
 - Is the critical region in (iv) more powerful than the critical region in (ii) ?
- c) Let X_1, X_2, \dots, X_n be a r.s. from $N(\theta, \delta^2)$ σ^2 known. Find uniformly most powerful critical region (UMPCR) of size α for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta < \theta_0$.



3. Attempt **any two** of the following : **(5 each)**

- a) Describe Kolmogorov-Smirnov test for one sample problem.
- b) Construct LRT of l.o.s. α for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$ where μ is mean of $N(\mu, \delta^2)$ σ^2 known distribution.
- c) The following sequence of males (M) and females (F) was observed at a ticket window of a theatre
MMFMMMFFMMMFFFFM
Test at 5% l.o.s., whether males and females arrive randomly at the ticket window.

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

- a) i) Construct SPRT of strength (α, β) for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1$ ($\theta_1 < \theta_0$) for an exponential variable with mean $\frac{1}{\theta}$. **5**
- ii) Following talk-times (in minutes) on cell phones were recorded for 10 randomly selected students :
8, 10, 7.5, 9, 8.5, 7.5, 8, 6.5, 8.5, 9.
Use sign test to test $H_0 : M = 8$ against $H_1 : M > 8$, where M is median of the population. Use $\alpha = 0.05$. **5**
- b) i) Describe Mann-Whitney test. **5**
- ii) Let X_1, X_2, \dots, X_n be a r.s. from Bernoulli distribution with parameter θ . Find BCR of size α for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1$ ($\theta_1 > \theta_0$). **5**



T.Y. B.Sc. (Semester – IV) Examination, 2012
STATISTICS (Principal) (Paper – VI)
ST-346 (A) : Statistical Ecology
(2008 Pattern)

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 meanings.**

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

a) In each of the following cases choose the correct alternative :

i) In logistic growth model the carrying capacity is given by

- A) K B) $2K$ C) $\frac{K}{2}$ D) K^2

ii) In Gompertz model growth rate is maximum at

- A) $\frac{K}{e}$ B) $\frac{2}{K}$ C) $\frac{K}{2}$ D) $\frac{e}{K}$

iii) Peterson's estimator of population size N for single recapture is

- A) $\frac{n_1 n_2}{m_2}$ B) $\frac{n_1 m_2}{n_2}$
C) $\frac{n_2 m_2}{n_1}$ D) $\frac{m_2}{n_1 n_2}$

iv) If n is sample size and s is total number of species in a community then Menhinick's richness index is

- A) $\frac{s}{\sqrt{n-1}}$ B) $\frac{s-1}{\sqrt{n}}$
C) $\frac{s}{\sqrt{n}}$ D) $\frac{s-1}{\sqrt{n-1}}$

(1 each)

P.T.O.



b) In **each** of the following cases 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 soil.

ii) Exponential growth model is not sigmoidal. **(1 each)**

c) Define **each** of the following :

i) Aggregated forest

ii) Stable equilibrium. **(1 each)**

d) i) Explain in brief, rare fraction curves.

ii) Explain individual to individual nearest neighbour distance. **(1 each)**

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

a) Describe line transect method for estimating animal population in forest. What is rational behind using exponential detection function ?

b) Derive the expression for logistic growth model.

c) Given the following projection matrix $M = \begin{bmatrix} 1 & 4 \\ 0.5 & 0 \end{bmatrix}$. Obtain stable population structure and comment on the growth of population. **(5 each)**

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

a) Describe capture-recapture method. Derive Peterson's estimator of population size (N) for single recapture, in case of closed population.

b) For a logistic growth model, find the population size at which growth rate is maximum.

c) Discuss the states of equilibria in Gompertz model. **(5 each)**



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

a) i) Show that for Gompertz model, growth rate $\frac{dN_t}{dt}$ is maximum at $\frac{k}{e}$. **4**

ii) Describe the method of quadrat sampling to estimate the population density in a forest. Also discuss the scope and limitations of quadrat sampling method. **6**

b) What is meant by point to individual nearest neighbour distances in Poisson forest ? Derive maximum likelihood estimator of parameter λ . Is this estimator unbiased ? If not, obtain its bias and give unbiased estimator of parameter λ . **10**



Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
STATISTICS (Principal) (Paper – VI)
ST-346 (B) : Medical Statistics
(2008 Pattern)

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. Attempt **each** of the following :

- a) In each of the following cases, choose the correct alternative : **(1 each)**
- i) The graph drawn by Dr. John Snow could find the cause of
 - A) malaria
 - B) scurvy
 - C) puerperal fever
 - D) cholera
 - ii) In epidemiology, logit function of probability π is given by
 - A) $\ln[\pi(1-\pi)]$
 - B) $\ln[\pi/(1-\pi)]$
 - C) $\ln[(1-\pi)/\pi]$
 - D) $\ln[\pi/(1+\pi)]$
 - iii) The relative risk of an event is always
 - A) positive
 - B) zero
 - C) negative
 - D) a number between zero and one
 - iv) The logistic growth equation is called sigmoidal because it is shaped like letter
 - A) V
 - B) Z
 - C) S
 - D) σ
- b) In **each** of the following cases, state whether the given statement is **true** or **false** : **(1 each)**
- i) A crossover design is modification of the randomized controlled trial.
 - ii) A bias is a systematic error.



c) Define the following terms : (1 each)

- i) $\pm 20\%$ rule for assessment of bioequivalence
- ii) blinding.

d) i) State the long form of FDA and CRO. 1

ii) Explain the term efficacy of drug. 1

2. Attempt **any two** of the following : (5 each)

a) Write a short note on ‘Parallel design’ used in clinical trials.

b) Discuss the importance of epidemiology, giving illustrations.

c) A survival model is defined by the following values of P_x for a radix of 1,00,000 :

Time Units (x)	0	1	2	3	4	5	6
Survival Probability (P_x)	0.95	0.90	0.80	0.50	0.30	0.10	0

Prepare life-table containing columns d_x, S_x, L_x, T_x .

3. Attempt **any two** of the following : (5 each)

a) Suppose μ_C and μ_T denote the mean responses of two formulations control (C) and test (T) with unknown variance. Explain how you test $H_0 : \mu_T = \mu_C$ against $H_1 : \mu_T > \mu_C$. Assuming equal sample sizes for both the test groups, find the expression for sample size of each group to get power $1 - \beta$.

b) Define hazard rate at age x denoted by $h(x)$. Also state its properties.

c) Explain Mc Nemar’s test for testing the hypothesis for symmetry of 2×2 contingency table with help of an illustration.



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

a) i) Explain in brief, Phase I study in clinical trials. 5

ii) Given below are caffeine concentration values after taking a dose.
Estimate C_{max} , T_{max} . Also calculate $AUC_{(0, 180)}$ 5

Time (in minutes)	10	30	60	90	120	180
Concentration (microgram/ml)	4	3	1	0.75	0.55	0.3

b) I) Suppose concentration at time $t(C_t)$ is given by model $C_t = C_{max} \exp \{-\lambda t\}$ where time is measured in hours. If $\ln C_t = 1.55 - 0.05 t$, find approximate values of

i) elimination half time $t_{1/2}$
ii) washout period. 5

II) Derive the equation for sigmoidal growth. 5



T.Y. B.Sc. (Semester – IV) Examination, 2012
STATISTICS (Principal) (Paper – VI)
ST-346 (C) : Statistical Computing using 'R' Software
Batch No.1 (On Line Paper)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All** questions are **compulsory**.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) **Each** question is to be solved using R software **installed** on your computer.
 - 4) **Attach** computer printout of your work to the **answer book** supplied to you.

1. Attempt **each** of the following : **(1 each)**

a) Create a vector X of following numbers :

1, 6, 12, 64, 13, 8, 26.

Using vector X create vector $Y = 2X$.

b) Find mean and median of following observations :

9, 8, 7, 12, 14, 11, 17, 16, 15, 14, 6.

c) Draw a random sample of size 5 from a P($m = 4.5$) distribution.

d) Create a data frame of roll number and names of 6 students.

e) Access data 'Nile' from package base and find its summary statistics.



f) Draw a box plot of following observations :

40, 33, 14, 17, 22, 27, 40, 32, 31, 27, 12, 17.

g) Draw a systematic sample of size 5 from a population of 25 units.

h) Simulate an experiment of tossing a coin 120 times and prepare its frequency distribution.

i) Let $X \sim N(\mu = 10, \sigma^2 = 6)$. Find $P[7 \leq X \leq 15]$.

j) Draw a rod plot for the following data :

x	2	4	5	6	8	11
f	3	11	15	24	13	2

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

(5 each)

a) Compute A.M., G.M. and H.M. of following observations :

1.5, 2.2, 6.5, 1.9, 6.2, 7.2, 0.5, 0.3, 1.7, 3.9.

Also verify the relation between them.

b) Draw a simple bar diagram using following data :

Year	2007	2008	2009	2010
Annual sales (in lakh Rs.)	12.5	14.1	11.6	8.8



c) Following are the data on the time (in mts) required to fill the bottles by two machines A and B :

A : 4.9 6.1 7.2 8.0 5.6 7.4 8.2

B : 7.4 2.5 7.7 6.3 4.2 8.3 4.7

Can we conclude that average time required by two machines is same. Take $\alpha = 0.05$.

3. Attempt **any two** of the following : **(5 each)**

a) Draw less than and more than ogive curves for the following data :

Marks	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
No. of Students	1	11	40	24	4

b) Fit a binomial distribution to the following data :

x	0	1	2	3	4	5
f	6	9	26	38	11	1

Also find expected frequencies and plot observed and expected frequencies.

c) Find mean deviation about mean and coefficient of variation for the following observations :

15, 27, 34, 25, 8, 9, 16, 31, 40, 11



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

- a) i) A coffee company appointed 4 salesmen A, B, C and D and observed their sales (in lakh Rs.) in 3 districts I, II and III as given below :

Salesman \ District	A	B	C	D
I	24	26	31	33
II	27	24	36	22
III	30	34	29	31

Perform two way analysis of variance using above data.

7

- ii) Find Bowley's coefficient of skewness for the following observations :

16, 21, 32, 40, 61, 8, 17, 26, 44, 25, 33, 11

3

- b) i) Fit a second degree parabola $Y = a + bX + cY^2$ to the following data :

X	2	4	7	10	13	16
Y	15	22	34	41	17	5

Also estimate Y for X = 19.

6



ii) A die is rolled 120 times and following results are obtained :

4

No turned up :	1	2	3	4	5	6
Frequency :	33	26	13	31	9	8

Test the hypothesis that die is unbiased. (Use $\alpha = 0.05$)



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOGRAPHY (Paper – I)
Gg.341 : Principles and Techniques of Watershed Management
(2008 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 questions in **one** or **two** sentences : **10**
- a) State two main hindrances in watershed development programs.
 - b) What is meant by food security ?
 - c) What is rain water harvesting ?
 - d) List the methods of soil conservation.
 - e) State two reasons for the need of agro-forestry in degraded land.
 - f) What is resource mapping ?
 - g) Define equity.
 - h) What are rain-fed catchments ?
 - i) List the methods of water harvesting.
 - j) What is Kanabundi ?
2. Write short answers (**any two**) : **10**
- a) Comment on the various watershed management practices.
 - b) Discuss the various methods used for soil conservation.
 - c) What are infrastructure surveys ?

P.T.O.



3. Write short notes (**any two**) : **10**
- a) Contour bunds
 - b) Landscape Restoration
 - c) Agro-forestry in degraded land.
4. Give an account of the various methods used for water conservation. **10**

OR

Explain the importance of food and livelihood security for watershed planning.



[4217] – 450

Seat
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOGRAPHY (Paper – II)
Gg 342 : Geography of Travel and Tourism
(2008 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 maps stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) What are Dharamshalas ?
 - b) What is farm tourism ?
 - c) Name two types of aerial adventure tourism.
 - d) State one impact of tourism on pollution emissions.
 - e) State one impact of tourism on language.
 - f) In which state is Darjeeling located ?
 - g) Name two national parks in India.
 - h) What is second home ?
 - i) Name two services in the tourism sector in India.
 - j) What is induced expenditure in tourism ?
2. Write short answers (**any two**) : **10**
- a) Methods of deriving tourism multipliers.
 - b) Significance of religious tourism in India.
 - c) Importance of tour packages.
3. Write short notes (**any two**) : **10**
- a) Sports tourism.
 - b) Range of services in the tourism sector.
 - c) Impact of tourism on the life style of local people.
4. Highlight the role of transportation in tourism. **10**

OR

Discuss the development of hill stations for tourism in India.



[4217] – 451

Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOGRAPHY
Gg – 343 : Fundamentals of Geoinformatics (Paper – III)
(2008 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) Define Image Enhancement.
 - b) What is geometric correction ?
 - c) Write the meaning of line drop.
 - d) When does Scan Skew distortion occur ?
 - e) List the reasons for the occurrence of low contrast in an image.
 - f) What is high pass filtering ?
 - g) What is unsupervised classification ?
 - h) Define re-sampling.
 - i) List the vector overlay tools.
 - j) What is spatial query ?
2. Write short answers (**any two**) : **10**
- a) Explain in short the various image data formats.
 - b) Explain geometric corrections.
 - c) Write a brief note on multi criteria analysis.

P.T.O.



3. Write short notes (**any two**) : **10**
- a) Raster overlay
 - b) Report writing in GIS
 - c) Unsupervised classification.

4. Give an account of the different types of queries used in GIS with examples. **10**

OR

Discuss difference between supervised and unsupervised classification.



[4217] – 452

T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOGRAPHY (Paper – IV)
Gg 344 : India-A Geographical Study (2008 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 Maps stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) Name two non-ferrous minerals.
 - b) What is siderite ?
 - c) State one important use of manganese.
 - d) Name two areas where tertiary coal is found in India.
 - e) Name two onshore oil fields in Western India.
 - f) What is green revolution ?
 - g) Name one salient feature of water transport.
 - h) State two factors affecting the location of the Iron and Steel industry.
 - i) Name one area of very low population density in India.
 - j) Name two economic factors affecting migration.
2. Write short answers (**any two**) : **10**
- a) Factors influencing the development of hydroelectric power in India.
 - b) Problems due to the green revolution in India.
 - c) The New Industrial Policy of India.
3. Write short notes (**any two**) : **10**
- a) Land reforms in India.
 - b) Impact of communication technology on the economy.
 - c) Energy crisis in India.
4. Discuss the complementary role of roads, railways, water-ways and airways in regional development. **10**

OR

Discuss the development and distribution of the textile industry in India.



[4217] – 453

Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
GEOGRAPHY
Gg.345 : Geography of Soils (Paper – V)
(2008 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) Mention various methods of soil managements.
 - b) What is soil degradation ?
 - c) Mention the uses of the soil as a resources.
 - d) State the Jenny's equation of soil formation.
 - e) Mention various types of soil erosion.
 - f) List the biochemical compounds present in the soil.
 - g) What do you mean by oxisols ?
 - h) What do you mean by ultisols ?
 - i) Mention favourable condition for decomposition of organic matter.
 - j) Explain the term 'Meso Fauna'.
2. Write short answers (**any two**) : **10**
- a) Describe the process of salinization.
 - b) Explain in brief the types of humus.
 - c) Describe the process of Podzolization.
3. Write short notes (**any two**) : **10**
- a) Role of living organisms in the soil formation.
 - b) Process of Laterization.
 - c) Causes of salinization.
4. Explain the factors of soil formation. **10**
- OR
- Write an account of formation of lateritic soils.
-



[4217] – 455

Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
MICROBIOLOGY (Paper – I)
MB-341 : Medical Microbiology – II
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) **All questions are compulsory.**
2) **All questions carry equal marks.**
3) **Draw neat labeled diagrams wherever necessary.**

1. Attempt the following :

10

A) Match the following :

A

- 1) β -lactams
- 2) Tetracycline
- 3) Bacitracin
- 4) Monensin
- 5) Sulfonamide

B

- a) Acts on cell membrane
- b) Blockage of lipid carrier
- c) Prevents attachment of aminoacyl t-RNA
- d) Inhibition of folate synthesis
- e) Inhibition of transpeptidase

B) Choose the most appropriate answer :

i) _____ is the skin cancer, commonly found in AIDS patients.

- | | |
|-----------------------|---------------------|
| a) Hodgkin's lymphoma | b) Kaposi's sarcoma |
| c) Carcinoma | d) Leukemia |

ii) All of the following can be transmitted by contaminated water, except

- | | |
|----------------------|------------------|
| a) Amoebic dysentery | b) Poliomyelitis |
| c) Hepatitis | d) Hepatitis B |

P.T.O.



C) State **true** or **false** :

- i) FMD is a small RNA virus.
- ii) MIC of the drug is used to decide the dosage.
- iii) Acyclovir is an antifungal agent.

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

- a) Give a comparative account of Salk and Sabin vaccine.
- b) Write a note on-*Dengue virus*
- c) Explain the mode of action of Polymyxin.

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

- a) Explain -Pathogenesis of FMD.
- b) Explain the mode of action of Penicillin.
- c) Draw and label-Life cycle of *Plasmodium*.

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

- A) Discuss desirable parameters of a good chemotherapeutic agent. Add a note on-Routes of drug administration.
- B) Describe influenza with respect to Causative agent, pathogenesis and laboratory diagnosis.



[4217] – 456

T.Y. B.Sc. (Semester – IV) Examination, 2012
MICROBIOLOGY (Paper – II)
MB – 342 : Genetics and Molecular Biology – II
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) **All** questions are **compulsory**.
2) **All** questions carry **equal** marks.
3) Draw neat, labeled diagram **wherever** necessary.

1. Attempt the following : 10

a) Fill in the blanks :

i) The mutant strains of bacteria requiring supplementation to minimal medium for their growth are called _____

ii) Genetic transfer between bacterial cells mediated by a bacteriophage is _____

iii) In genetic engineering the cut DNA is joined by _____ enzyme.

iv) F plasmid carrying the donor chromosomal genes is called _____

v) F plasmid integrated with the donor chromosome is _____

b) Match the following :

A

B

i) PCR technique

a) *Streptomyces coelicolor*

ii) SCP plasmids

b) DNA amplification

iii) Joining blunt ends

c) Vector in genetic engineering

iv) BAC

d) Bacteriophage with bacterial genome

v) Transducing particle

e) Linker

P.T.O.



2. Draw neat labeled diagrams of **any two** of the following : 10
- a) *pBR* plasmid.
 - b) *Cis-trans* test.
 - c) *Breakage and reunion model* of recombination.
3. Write short notes on **any two** of the following : 10
- a) Gene mapping by *Interrupted mating* experiment.
 - b) Agarose gel electrophoresis.
 - c) Restriction enzymes.
4. Attempt **any one** of the following : 10
- a) Describe in detail the role of *Com* genes in development of competence. Add a note on gene transfer by transformation in *Streptococcus pneumoniae*.
 - b) Describe in detail *homologous* recombination and the role of *rec A*, *rec BCD* and *ruv* sy stem.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
MICROBIOLOGY (Paper – IV)
MB-344 : Immunology – II
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) **All questions are compulsory.**
2) **All questions carry equal marks.**
3) **Draw neat labeled diagrams wherever necessary.**

1. Attempt the following :

10

a) Define -

- i) Polymorphism of MHC
- ii) Allograft
- iii) Antitoxin.

b) State **true** or **false** :

- i) MHC plays an important role in maturation and differentiation of B cells.
- ii) Vaccination protects the host against polio.

c) Match the following :

A

- i) MHC Antigen typing
- ii) Antibody dependent cytotoxicity
- iii) Antigen presentation
- iv) Immunization schedule
- v) Rh-positive blood group

B

- a) Differentiation of T cells
- b) Pre-natal and post-natal vaccines
- c) Type IV hypersensitivity
- d) cDe genotype
- e) Microcytotoxicity

P.T.O.



2. Attempt **any two** of the following : **10**
- a) Draw neat labeled diagram of Type I and Type II hypersensitivity.
 - b) Describe the structure and function of MHC Class I molecules.
 - c) Explain Direct and Indirect Coombs test.
3. Write short notes on **any two** of the following : **10**
- a) Types of Grafts.
 - b) Principles of Immunization.
 - c) Interferons.
4. Attempt **any one** of the following : **10**
- a) Describe activation and differentiation of B cells.
 - b) Explain 'Bombay blood group system'. Write medico-legal applications of blood groups.



[4217] – 462

Seat
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012
ELECTRONIC SCIENCE
EL-342 : Embedded Systems (Paper – II)
(New Course) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Attempt **all** the following :

- a) Write the magnitude of signed character. 1
- b) What is the difference between the 'sbit' and 'bit' data types ? 1
- c) What is the function of SBUF register ? 1
- d) How many address lines are required to interface 16 KB external RAM to 8051 micro controller ? 1
- e) Find the content of P3 after execution of the following, 2
 $P_1 = 0XFF ;$
 $P_3 = P_1 \wedge 0XFF;$
 $P_3 = \sim P_3 ;$
- f) State the advantages of 'C' codes for 8051 programming. 2
- g) What number should be loaded into TH register using mode 2 to get 100 μ s delay ? Assume XTAL = 11.05 92 MHz. 2
- h) What voltage levels are used for binary 0 and 1 in RS 232 ? 2

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

- a) Write an 8051 C program to send values of –4 to +4 to port P2. 4
- b) Explain how the delay length in 8051 using timer depends on three factors. 4
- c) Write C program for 8051 to transfer message 'SIR' serially at 4800 baud, 8 bit data, 1 stop bit continuously. 4

P.T.O.



3. Attempt **any two** of the following :
- a) Write an 8051 C program to convert packed BCD OX 23 to ASCII and display the bytes on P1 and P2. 4
 - b) Draw and explain the connections of 8051 micro controller to RS 232 using line driver MAX 232 chip. 4
 - c) Draw the block diagram of 8051 based target board. List the different components used on it. 4
4. Attempt **any two** of the following :
- a) Discuss the case study of object counter. 6
 - b) Draw the block diagram of temperature measurement system using 8051 micro controller and explain it. 6
 - c) Explain with suitable example, bitwise logical operators in 8051 C programming. 6

OR

4. Attempt **all** the following :
- a) Write 8051 C program that finds number of one's in an 8-bit data item. 4
 - b) Assume that 1Hz external clock is being fed into pin TO (P3.4). Write C program for counter 0 in model 1 to count pulses and display the TH0 and TLO registers on P2 and P1 respectively. 4
 - c) Interface suitable RTC to 8051 microcontroller and state the importance of ALE pin. 4





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Seat No.	
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**T.Y. B.Sc. (Semester – IV) Examination, 2012
ELECTRONIC SCIENCE (Paper – IV)
EL – 344 : Electronic Materials and Devices
(2008 Pattern) (New Course)**

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.*
4) *Log table / calculator is **allowed**.*

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

- | | |
|---|---|
| a) What is core loss ? | 1 |
| b) Define dielectric strength. | 1 |
| c) What is doping ? | 1 |
| d) Draw the symbol of photo diode. | 1 |
| e) State important properties of conductor. | 2 |
| f) Define electrical susceptibility. | 2 |
| g) What is heterostructure device ? | 2 |
| h) What is NEMS ? | 2 |

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

- | | |
|--|---|
| a) What is polymer ? Explain two main methods of preparing polymers. | 4 |
| b) Explain Electronic polarization. | 4 |
| c) Explain with diagram structure of carbon nano tubes. | 4 |

P.T.O.



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

- a) Explain hysteresis characteristics of magnetic materials. **4**
- b) Explain the phenomenon of doping in N-type of semiconductor. **4**
- c) Distinguish between JFET and MOSFET. **4**

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

- a) Explain local field and derive Clausius-Mossotti equation. **6**
- b) What are organic semiconductors ? Explain any one in detail. **6**
- c) Explain with working principle of P-N junction with forward bias, reverse bias and no bias conditions. **6**





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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
ELECTRONIC SCIENCE (Paper – VI)
EL- 346 (A) : Instrumentation (Optional) (Ele. – II)
(2008 Pattern)

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 **all** of the following :

- a) State any two methods of correction for interfering and modifying inputs. 1
- b) Why potentiometer is not exactly a zero order system ? 1
- c) What is ground loop ? 1
- d) Write the operating frequency of WWVB station of NIST. 1
- e) State any four sources of noise for a instrumentation system. 2
- f) “Sensitivity of bridge reduces due to finite meter resistance”. Comment. 2
- g) List the basic components of a DAS. 2
- h) “Absorption wavemeter is used to measure the phase difference”. Comment. 2

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

- a) With suitable example explain how method of signal filtering is useful for correction of interfering inputs ? 4
- b) Discuss the step response of first order system. 4
- c) What is lock in amplifier ? Explain its working. 4

P.T.O.



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

- a) Explain dead time element with suitable examples. 4
- b) Explain GIM bus of GPIB system. 4
- c) With the help of block diagram explain the working of simple workshop built spectrum analyser. 4

4. Answer **any two** of the following :

- a) What are various functional elements of generalized measurement system ? Explain each element in brief. 6
 - b) Draw circuit diagram of instrumentation amplifier using three operational amplifiers. Derive expression for its output voltage. 6
 - c) Explain multichannel DAS with multiplexing the outputs of sample and hold circuits. 6
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T.Y. B.Sc. (Semester – IV) Examination, 2012
ELECTRONIC SCIENCE (Paper – VI)
EL- 346 (B) : Consumer Electronics (Optional) (Ele. – II)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :*** 1) ***All questions are compulsory.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

1. Attempt **all** the following :

- a) How the audio signals are recorded on magnetic tape ? 1
- b) What is IF for TV receiver ? 1
- c) What is MP3 ? 1
- d) State basic principle of microphone. 1
- e) What is HDTV ? List its important advantage. 2
- f) 'Bluetooth is wireless communication'. Comment. 2
- g) State any two characteristics of Bar code. 2
- h) Mention the frequency used in microwaves and digital clock. 2

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

- a) Draw block diagram of AM/FM receiver. Explain its action. 4
- b) Explain in brief Home theatres with neat diagram. 4
- c) Write short note on GPRS system. 4



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

- a) What are different types of loudspeakers ? Explain in brief any one. **4**
- b) Draw block diagram for DVD/VCD playback system and explain its working. **4**
- c) With the help of neat diagram, explain the working of inkjet printer. **4**

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

- a) Draw the block diagram of colour TV. Explain its action in stepwise. **6**
- b) What is GPS navigation system ? Explain its functioning with the help of block diagram. **6**
- c) Draw the functional block diagram of microwave oven along with power supply unit. Explain each block in brief. **6**





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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES
DS-342 : Economic Aspects of War
(Paper – II) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

N.B.: 1) **All** questions are **compulsory**.
2) **Each** questions carry **equal** marks.

1. Answer in **two to four** sentences **each** : **16**
 - 1) How you would like to define peacetime economy ?
 - 2) What do you mean by war potential ?
 - 3) State the meaning of Real cost of war.
 - 4) What do you mean by contributory elements of war finance ?
 - 5) Write the meaning of Threat perception.
 - 6) What are the techniques of price control ?
 - 7) How you would like to define economic warfare ?
 - 8) What do you mean by Parliamentary control over Defence Budget ?

2. Answer in **8 to 10** sentences **each (any two)** : **8**
 - 1) Explain merits of war time economy.
 - 2) Discuss demerits of peace time economy.
 - 3) Explain economic elements of war potential.

3. Write short note on **(any two)** : **8**
 - 1) Defence and Development.
 - 2) Cost of war.
 - 3) Effects of war on society.

4. Answer in **16 to 20** sentences **(any one)** : **8**
 - 1) Establish relationship between National Security and Economy.
 - 2) Analyse India's defence expenditure from 1971 to present day.



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – III)
DS-343 : Disaster Management
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

N.B. : 1) All questions are compulsory.
2) Each questions carry equal marks.

1. Answer in **two to four** sentences each : **16**
- 1) How you would like to define Disaster ?
 - 2) What do you mean by Self Government action ?
 - 3) State the meaning of R&D contribution in disaster.
 - 4) What do you mean by Relief work ?
 - 5) Write any two remedial measures in disaster management.
 - 6) What do you mean by Early warning system in disaster management ?
 - 7) Explain the meaning of Disaster prevention.
 - 8) What do you mean by Tsunami ?
2. Answer in **8 to 10** sentences each (**any two**) : **8**
- 1) Explain elements of Disaster Management.
 - 2) Discuss role of the volunteers in Disaster Management.
 - 3) Explain need for boosting morale of community in Disaster Management.

P.T.O.



3. Write short notes on (**any two**) : **8**

1) Need for Professional Training.

2) Remedial Measures

3) Types of Disaster.

4. Answer in **16 to 20** sentences (**any one**) : **8**

1) Establish relationship between National Security and Disaster.

2) Explain Socio-Economic impact of Disaster Relief Operations.



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Seat No.	
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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES
DS-345 : Information Technology and National Security
(2008 Pattern) (Paper – V)

Time : 2 Hours

Max. Marks : 40

N.B.: i) *All questions are compulsory.*
ii) *Each questions carry equal marks.*

1. Answer in **two to four** sentences each : **16**
 - 1) What do you mean by application of computer in Defence Management ?
 - 2) What do you mean by CAM ?
 - 3) State the meaning of scientific approach to Medical aspects.
 - 4) What do you mean by Target acquisition system ?
 - 5) Write the meaning of CAD.
 - 6) What is Operational Research ?
 - 7) What do you understand by perspective planning in Defence Management ?
 - 8) What do you mean by Battle field Information System ?

2. Answer in **8 to 10** sentences each (**any two**) : **8**
 - 1) Explain types of Computer.
 - 2) Discuss Data representations and Analysis.
 - 3) Explain Missile Defence system.

3. Write short note on (**any two**) : **8**
 - 1) Computerized Battle Management System
 - 2) Application of IT in Weapon system
 - 3) Surveillance and weapon system.

4. Answer in **16 to 20** sentences (**any one**) : **8**
 - 1) Explain Information Technology and its role in National development and National security.
 - 2) Analyses “Use of computer in Defence Management”.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VI)
DS – 346 (A) : Indian Military System (II) (Optional)
(2008 Pattern) (Ele. – VI)

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 : **16**
 - 1) When and between whom the third battle of Panipat was fought ?
 - 2) What do you know about Cholas and Vijayanagar ?
 - 3) State the weapons of Sultan.
 - 4) What do you know about plain of Panipat ?
 - 5) State the meaning of Mansabdar.
 - 6) What do you know about Ahmed Shaha Abdali ?
 - 7) What was the aim of Mughals for battle of Haldighat ?
 - 8) State any two names of distinguish rulers of Mughal period.
2. Answer in **8** to **10** sentences (**any two**) : **8**
 - 1) Write a few lines on “Babar”.
 - 2) Explain in brief military system of Mughals.
 - 3) Write in brief “India’s Southern Empires”.
3. Write short notes on (**any two**) : **8**
 - 1) Ghiasuddin Balban
 - 2) Art of warfare of Sultan
 - 3) Battle of Haldighat.
4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) Analyse the causes of decline of Mughals.
 - 2) Explain the first battle of Panipat and its significance for Indian military history.

P.T.O.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VI)
DS – 346 (B) : Maratha Military System (II) (Optional)
(2008 Pattern) (Ele. – VI)

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 : **16**
- 1) When and between whom the third battle of Panipat was fought ?
 - 2) Which tactics was introduced by Shivaji ?
 - 3) State any two causes of downfall of Maratha.
 - 4) What do you understand by Peshwa ?
 - 5) Why the first Anglo-Maratha war took place ?
 - 6) What do you know about Santaji ?
 - 7) Why Shahu was released by Mughals ?
 - 8) What was the result of Third - Anglo-Maratha War ?
2. Answer in **8** to **10** sentences (**any two**) : **8**
- 1) Write in brief the Maratha navy under Kanhoji Angre.
 - 2) Explain the achievements of Sambhaji.
 - 3) Write in brief Battle of Bhopal.
3. Write short notes on (**any two**) : **8**
- 1) Dhanaji
 - 2) Tarabai
 - 3) End of Sambhaji.
4. Answer in **16** to **20** sentences (**any one**) : **8**
- 1) Assess Shivaji as a 'Military Leader'.
 - 2) Explain in detail the "Nature and causes" of Anglo-Maratha conflict.
-



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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VI)
DS – 346 (C) : Indian Wars since Independence (II) (Optional)
(2008 Pattern) (Ele. – VI)

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 : **16**
 - 1) What was India's aim during Indo-Pak War of 1971 ?
 - 2) State the India's aim during Kargil episode of 1999.
 - 3) Write the meaning of I.P.K.F.
 - 4) Why India sent her force to Sri Lanka ?
 - 5) Write the duration of Indo-Pak War of 1971.
 - 6) Who played the role of Mediator during Kargil episode of 1999 ?
 - 7) Why India sent her forces to Maldives ?
 - 8) Write the location of Kargil.

2. Answer in **8** to **10** sentences (**any two**) : **8**
 - 1) Write the few lines on Simla Agreement of 1972.
 - 2) Highlight on the background of Kargil episode of 1999.
 - 3) Write in brief causes of India's action in East Pakistan during 1971.

3. Write short notes on (**any two**) : **8**
 - 1) India's tactics during Indo-Pak War of 1971.
 - 2) Affected areas during Kargil episode of 1999.
 - 3) Mukti-Bahini.

4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) Explain in detail the political negotiations and ceasefire during Kargil episode of 1999.
 - 2) Describe the grand strategy and strategy of India during Indo-Pak War of 1971.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VII)
DS-347 (A) : Military Psychology (Optional)
(2008 Pattern) (Ele – VII)

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences each : **16**
 - 1) Define 'Psychology'.
 - 2) Define 'Organisational Psychology'.
 - 3) Define 'Military Psychology'.
 - 4) What is War ?
 - 5) What is meant by 'Soldiering' ?
 - 6) Define 'Motivation'.
 - 7) Define 'Morale'.
 - 8) What is the concept of leadership ?

2. Answer in **8 to 10** sentences (**any two**) : **8**
 - 1) What is War Neurosis ?
 - 2) What is combat stress ?
 - 3) How a soldier overpower the fear of death ?

3. Write short notes on (**any two**) : **8**
 - 1) Military Morale
 - 2) Military Motivation
 - 3) Military leadership.

4. Answer in **16 to 20** sentences (**any one**) : **8**
 - 1) Discuss the role of propaganda in fighting psychological war.
 - 2) Explain the military uses of Psychology.

P.T.O.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VII)
DS-347 (B) : Defence Journalism and National Security
(2008 Pattern) (Ele – VII)

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences each : **16**
 - 1) Define National Security.
 - 2) Write the role of MOD.
 - 3) Define 'Air Power'.
 - 4) What is 'LASER' ?
 - 5) Name all the commands of Army.
 - 6) Write the role of Coast Guard.
 - 7) Define Military Security.
 - 8) What is 'Defence Budget' ?

 2. Answer in **8 to 10** sentences (**any two**) : **8**
 - 1) How perfection is achieved in defence reporting ?
 - 2) Explain the problems in Defence Reporting.
 - 3) Explain Media Ethics.

 3. Write short notes on (**any two**) : **8**
 - 1) Communication system in Armed forces
 - 2) War logistics
 - 3) Concept of Republic Day Parade.

 4. Answer in **16 to 20** sentences (**any one**) : **8**
 - 1) Make a reporting of counter insurgency operation.
 - 2) Give a report of India's defence Production.
-



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T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES (Paper – VII)
DS-347 (C) : Defence Preparedness of India – II (Optional)
(2008 Pattern) (Ele – VII)

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 : **16**
 - 1) Define “War potential”.
 - 2) Write the name of Defence Minister of India.
 - 3) Who is the chief of Naval Staff at present ?
 - 4) State the meaning of Modernization.
 - 5) What do you understand by Brahmos ?
 - 6) What is Arjun ?
 - 7) Where the HQ of Indian Navy is located ?
 - 8) State any two weapons of Indian Airforce.

2. Answer in **8 to 10** sentences (**any two**) : **8**
 - 1) Write few lines on commands of Indian Airforce.
 - 2) Explain in brief the structure of Army Commands.
 - 3) Explain the concept of war potential

3. Write short notes on (**any two**) : **8**
 - 1) Problems of modernisation of Indian Navy.
 - 2) Indias Nuclear potential.
 - 3) Commands of Indian Navy.

4. Answer in **16 to 20** sentences (**any one**) : **8**
 - 1) Compare the war potential of India & Pakistan in the present context.
 - 2) Explain the India’s quest for modernisation of Army.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES – VIII
DS – 348 (A) : Refugees Studies (Optional)
(2008 Pattern) (Ele – VIII)**

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences **each** : **16**
 - 1) Who is termed as 'Refugee' ?
 - 2) What is the rights of Refugee ?
 - 3) What is NCHR ?
 - 4) Define 'Political Asylum'.
 - 5) Define 'Human Rights'.
 - 6) What is the difference between POW and Refugee ?
 - 7) What is UNCHR ?
 - 8) Define migration.

2. Answer in **8 to 10** sentences (**any two**) : **8**
 - 1) Explain Humanitarian law on Refugee.
 - 2) Write the basic concept of Refugee.
 - 3) Write the causes of Migration.

3. Write short notes on (**any two**) : **8**
 - 1) Refugee law
 - 2) Duties of Refugees
 - 3) Stateless person.

4. Answer in **16 to 20** sentences (**any one**) : **8**
 - 1) Today the principles and applications of Refugee law is perhaps at its most acute ? Discuss.
 - 2) Write an essay on an international refugee problem.

P.T.O.



**T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES – VIII
DS – 348 (B) : Study of United Nations (Optional) (Ele – VIII)**

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 : **16**
 - 1) What do you mean by UN ?
 - 2) State the meaning of WHO.
 - 3) Define “Human Rights”.
 - 4) What do you mean by Disarmament ?
 - 5) What do you understand by ILO ?
 - 6) State any two names of principle organs of UN.
 - 7) Which agency of UN dealing with security relevant issues ?
 - 8) State the meaning of IMF.

 2. Answer in **8** to **10** sentences (**any two**) : **8**
 - 1) Explain in brief “Trusteeship Council”.
 - 2) Write in brief concept of Human Rights as per UN.
 - 3) Do you think that expansion of Security Council is vital ?

 3. Write short notes on (**any two**) : **8**
 - 1) UNESCO
 - 2) Disarmament under UN
 - 3) WHO

 4. Answer in **16** to **20** sentences (**any one**) : **8**
 - 1) Which changes you would like to suggest for restructuring of UN ? Explain.
 - 2) Assess the role of UN for preserving the “Human Rights” with examples.
-



**T.Y. B.Sc. (Semester – IV) Examination, 2012
DEFENCE AND STRATEGIC STUDIES – VIII
DS – 348 (C) : Laws of War and Peace (Ele – VIII)**

Time : 2 Hours

Max. Marks : 40

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

1. Answer in **2 to 4** sentences **each** : **16**
 - 1) Define 'Peace'.
 - 2) Define 'law'.
 - 3) Define 'war'.
 - 4) What is 'Neutral Rights' ?
 - 5) What is Intervention ?
 - 6) Define 'Convention'.
 - 7) Define 'Disputes'.
 - 8) What is war crimes ?

2. Answer in **8 to 10** sentences (**any two**) : **8**
 - 1) Explain about State succession.
 - 2) Write the concept of collective security.
 - 3) Discuss the right of self defence.

3. Write short notes on (**any two**) : **8**
 - 1) Disarmament
 - 2) Intervention
 - 3) Recognition of States.

4. Answer in **16 to 20** sentences (**any one**) : **8**
 - 1) Explain the laws of Naval warfare.
 - 2) Explain the laws of war about POW and wounded soldiers.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
ENVIRONMENTAL SCIENCE (Paper – I) (New Course)
ENV 341 : Aquatic Ecosystems and Management (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) *All questions are compulsory.*
2) *Neat and labeled 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 the term 'parasitism'.
 - b) Differentiate between tourism and eco-tourism.
 - c) Mention any two types of freshwater system.
 - d) What do you mean by zonation ?
 - e) Define edge effect.
 - f) Name any 2 RAMSAR sites in India.
 - g) Enlist any two phytoplankton from the aquatic system.
 - h) What is the meaning of restoration of waterbody ?
 - i) Mention the properties of brackish water.
 - j) Define eco-development.
2. Write a short note on (**any two**) : **10**
 - a) Ecological significance of mangroves.
 - b) Methods of sampling.
 - c) Lotic system.
3. Answer **any two** from the following : **10**
 - a) Discuss the role of planktonic community in aquatic system.
 - b) Enlist various types of freshwater system and discuss the associated biota.
 - c) What is the impact of pollution on aquatic systems ?
4. Attempt **any one** of the following : **10**
 - a) Explain the estuarine system, with respect to types, biota and productivity.
 - b) What do you mean by restoration ? Discuss any two case studies of Wetland restoration.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
ENVIRONMENTAL SCIENCE (Paper – III)
ENV 343 : Air and Soil Quality
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) *All questions are compulsory.*
2) *Neat and labelled 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 is Smog ?
 - b) Define : Soil aeration.
 - c) Give the difference between Ped and Clod.
 - d) Name any two types of soil water.
 - e) Mention any two roles of organic matter in soil.
 - f) Define the term CFC's.
 - g) What is soil texture ?
 - h) Give any two functions of Ca.
 - i) Define : Acid rain.
 - j) What is Biological nitrogen fixation ?

2. Write a short note on **(any two)** : **10**
 - a) Status of Air pollution in India.
 - b) Agents of soil erosion.
 - c) Soil as a sink for waste disposal.

3. Answer **any two** from the following : **10**
 - a) Explain in detail any five factors affecting soil structure.
 - b) Describe Chernobyl disaster and mention the ethics of the same.
 - c) Discuss industrial pollution with suitable case study.

4. Attempt **any one** of the following : **10**
 - a) Describe in detail the concept and evaluation of soil fertility.
 - b) How to remediate contaminated soil. Explain in detail with suitable examples.



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T.Y. B.Sc. (Semester – IV) (Environmental Science) Examination, 2012
Env 344 : ISSUES IN ENVIRONMENTAL SCIENCE
(New Course) (2008 Pattern) (Paper – IV)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Neat and labeled 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) Give the full form of CNG.
 - b) What is meant by resource depletion ?
 - c) Define remote sensing.
 - d) Enlist any two green house gases.
 - e) What is meant by urbanisation ?
 - f) Which gas was released during Bhopal gas tragedy ?
 - g) Define eutrophication.
 - h) What is cause of goitre ?
 - i) What is meant by wasteland ?
 - j) Define desertification.
2. Write a short note on **any two** : **10**
 - a) Parameters of urban planning.
 - b) Solid waste management.
 - c) Convention of biodiversity.
3. Answer **any two** from the following : **10**
 - a) What are the strategies of sustainable development ?
 - b) Explain Ganga Action Plan.
 - c) What are the consequences of natural resource depletion ?
4. Attempt **any one** of the following : **10**
 - a) Explain any two natural disasters with disaster management.
 - b) Explain the rainwater harvesting process with diagram and advantages.



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Seat No.	
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**T.Y. B.Sc. (Semester – IV) (Environmental Science) Examination, 2012
(New Course) (Paper – VI) (2008 Pattern)
ENV 346 : ENVIRONMENTAL BIOTECHNOLOGY – II**

Time : 2 Hours

Max. Marks : 40

- Instructions**
- 1) *All questions are **compulsory**.*
 - 2) *Neat and labeled 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 Bioaugmentation.
 - b) State advantages of Bioleaching.
 - c) What are Xenobiotic compounds ?
 - d) Which factor limits the efficiency of biological treatment ?
 - e) What are facultatively anaerobe ?
 - f) Give the composition of Biogas.
 - g) What is digester ?
 - h) Write the names of the bacterial group important in methane generation.
 - i) Name the treatment which uses biofilm formed by microbes.
 - j) What is phytoremediation ?

2. Write a short note on **(any two)** : **10**
 - a) Biosorption.
 - b) Activated sludge.
 - c) Removal of nitrate.

P.T.O.



3. Answer **any two** from the following : **10**
- a) Draw neat labelled diagram of UASB reactor.
 - b) Discuss advantages and disadvantages of Bioleaching.
 - c) Describe in brief the metabolism of pesticides and xenobiotics.
4. Attempt **any one** of the following question : **10**
- a) Discuss the various aspects of energy generation using biomass.
 - b) Describe in detail role of biotechnology in Environment protection with example.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
INDUSTRIAL CHEMISTRY (Vocational) (Paper – V)
Entrepreneurship Development
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer precisely the following : 10
- a) Define the term 'Entrepreneur Development'.
 - b) Who is an imitating entrepreneur ?
 - c) What is an entrepreneurial culture ?
 - d) Define SSI.
 - e) Name one market survey technique.
 - f) Define the term Joint-stock company.
 - g) Give the full form of 'IDBI' and 'MCED'.
 - h) What is marketing mix ?
 - i) Define VAT.
 - j) What are soft skills ?
2. A) Answer **any two** of the following : 6
- a) Give the advantages of sole trading concern.
 - b) What are the important qualities of a successful industrial entrepreneur ?
 - c) State the steps involved in Marketing research.
- B) Answer briefly **any two** of the following : 4
- a) Give the functions of DIC.
 - b) What is project report ?
 - c) What is 'SWOT' analysis ?

P.T.O.



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

- a) What are the objectives of Management training programme ?
- b) Describe the functions involved in human resource management.
- c) Discuss the role of various funding agencies.

4. a) Define the term Company. What are the advantages and disadvantages of joint stock company ? 6

OR

a) Explain in detail break-even analysis. 6

b) Answer **any one** of the following : 4

- i) Explain in brief how a project report can be evaluated.
- ii) Write a note on - cash flow statement.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
BIOTECHNOLOGY
VOC – BIOTECH – 345 : Entrepreneurship Development
Vocational – (Paper – V) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer each of the following in **1-2** lines. **10**
 - a) Define communication.
 - b) Give the full form of NIESBUD.
 - c) Name one of the market survey techniques.
 - d) What is a partnership firm ?
 - e) What is SIDBI ?
 - f) Define VAT.
 - g) What is the full form of MSFC ?
 - h) Give a function of the Maharashtra State Electricity Board.
 - i) Give full form of MIDC ?
 - j) Define Entrepreneurship.
 2. Answer **any two** of the following : **10**
 - a) Explain the characteristic of an entrepreneur.
 - b) Discuss the significance of communication skills in Human Resource.
 - c) Give the role of a consultancy organization.
 3. Write short notes on **any two** of the following : **10**
 - a) SWOT analysis
 - b) Types of small scale Industries
 - c) Sales and Service Tax
 4. Define marketing. Explain marketing mix in details. **10**
- OR
4. Explain project formulation in details.
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T.Y. B.Sc. (Semester – IV) Examination, 2012
Vocational (Paper – V)
ELECTRONIC EQUIPMENT AND MAINTENANCE
Entrepreneurship Development
(New Course) (2008 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, calculators is **allowed**.

1. Answer the following : **(3×4=12)**
- a) Answer the following : **(4×1=4)**
- i) Define the term marketing.
- ii) Explain the meaning of price.
- iii) What is working capital ?
- iv) What is meant by 'service industry' ?
- b) Comment on the following : **(2×2=4)**
- i) Market research plays important role in the development of small scale industry.
- ii) Entrepreneur must have good communication skill.
- c) Answer the following : **(2×2=4)**
- i) State the objectives of Human Resource Management.
- ii) What is a co-operative organisation ?

P.T.O.



2. Answer **any two** of the following : **(2×4=8)**
- a) Explain advantages and disadvantages of partnership.
 - b) What is sole proprietorship ? Discuss its advantages and limitations.
 - c) Explain the content of a project report which is presented to obtain finance for a new business venture.

3. Answer **any two** of the following : **(2×4=8)**
- a) Discuss the role played by state finance corporation in development of entrepreneurship.
 - b) State the importance and need of entrepreneurship development.
 - c) Explain the roles and responsibilities of entrepreneur.

4. Answer **any two** of the following : **(2×6=12)**
- a) Elaborate the evolution of the concept of Entrepreneur.
 - b) Describe the various promotional steps necessary for starting a small scale Industrial unit.
 - c) Explain the role played by an Entrepreneur in Indian economy.

OR

4. Give difference between following : **(3×4=12)**
- a) Business and Profession.
 - b) Entrepreneur and Manager.
 - c) Entrepreneur and Entrepreneurship.



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T.Y. B.Sc. (Semester – IV) (Vocational) Examination, 2012
INDUSTRIAL MICROBIOLOGY (Paper – V)
VOC-IND-MIC-345 : Molecular Biology and Recombinant DNA Technology
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer the following : 10
- a) Define : Genetic Engineering.
 - b) Write recognition site and cutting site of Sma I.
 - c) Write two examples of genetic disorders.
 - d) Enlist the markers present on pUC 18.
 - e) What is blue white screening ?
 - f) Name two modifications of PCR.
 - g) *Thermus aquaticus* strain YT-1 was isolated from sample from _____ by _____ and _____.
 - h) Write **true** or **false** with reason :
Use of transgenic plants is beneficial.
 - i) Write the principle of automated sequencing.
 - j) Enlist the efficient promoters used in expression vectors.
2. Attempt **any two** of the following : 10
- a) Discuss in brief the techniques used to transfer foreign DNA to plants.
 - b) Compare Maxam Gilbert and Sangers method of DNA sequencing.
 - c) Justify : Recombinant vaccines are preferred to traditional vaccines in spite of their high cost.

P.T.O.



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

Comment on :

- a) Use of phage as a vector
- b) DNA fingerprinting
- c) Radioactive labeling and detection by autoradiography.

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

- a) What is Southern blotting technique ? Elaborate on its principle, working and applications.
- b) Explain C-DNA cloning and discuss its importance in eukaryotic gene manipulation.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
INDUSTRIAL CHEMISTRY (Vocational)
(Paper – VI)
Inorganic and Organic Based Industries – II
(2008 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.**

1. Answer the following questions : 10
- a) Define a polymer.
 - b) What is latex ?
 - c) Define the term “Micelles”.
 - d) What is a drug ?
 - e) Define the term “Perfume”.
 - f) What is synthetic resin ?
 - g) State the types of fixatives.
 - h) What are analgesics ? Give one example.
 - i) Define the term “surfactant”.
 - j) Define the term ‘chromophores’. Give one example.
2. A) Answer **any two** of the following : 6
- a) What is teflon ? Write important properties of teflon.
 - b) Explain the washing action of soaps and detergents.
 - c) Explain the synthesis of methyl orange.

P.T.O.



- B) Answer **any two** of the following : 4
- a) What are the requirements of a good drug ?
 - b) Draw the structure of vanillin ? How it is prepared ?
 - c) What is atactic, syndiotactic and isotactic ?
3. Write notes on **any two** of the following : 10
- a) Synthetic penicillins.
 - b) Raw materials required for manufacture of detergents.
 - c) Vulcanization.
4. A) What are anaesthetics ? What are the different types of anaesthetics ?
Give the synthesis of Benzocaine. 6
- OR
- A) Describe the manufacturing of Nylon-66 with flow sheet diagram. 6
4. B) Answer **any one** of the following : 4
- a) What is piperonal ? How it is prepared ?
 - b) Describe the manufacturing of soap by continuous process.
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T.Y. B.Sc. (Semester – IV) Examination, 2012
BIOTECHNOLOGY (Vocational) (Paper – VI)
VOC. BIOTECH – 346 : Microbial and Animal Biotechnology
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

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

1. Answer **each** of the following in **1-2** lines : **10**
 - a) What is an impeller ?
 - b) What are stem cells ?
 - c) What is microbial biotechnology ?
 - d) Define interferons.
 - e) Name any organic acid with an example of its producing microorganism.
 - f) Name one cationic and one anionic exchanger.
 - g) Define the term patent.
 - h) What is the role of tPA ?
 - i) What is downstream processing ?
 - j) Define confluency.

2. Attempt **any two** of the following : **10**
 - a) Diagrammatically represent and explain a fermenter design.
 - b) Describe the process of industrial waste water treatment and disposal in brief.
 - c) Discuss the various methods of purification of products of animal tissue culture.

3. Attempt **any two** of the following : **10**
 - a) Write a short note on Inoculum Development.
 - b) Discuss the mass production of PDGF and EGF in detail.
 - c) What is gene therapy ? Explain its types.

4. Attempt **any one** of the following : **10**
 - a) Describe the process of soy sauce production emphasizing on the method of koji preparation.
 - b) Describe in detail the process of production of Monoclonal Antibodies.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
Electronic Equipment and Maintenance
Vocational (Paper – VI)
MEDICAL INSTRUMENTATION
(2008 Pattern) (New Course)

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, calculators is allowed.**

1. a) Answer the following : **(4×1=4)**
 - i) State the active component in red blood cells.
 - ii) What is fibrillation ?
 - iii) What is typical potential of a depolarised cell ?
 - iv) What is nomogram ?
 - b) Answer the following : **(2×2=4)**
 - i) State full forms of :
a) ECG b) CNS c) CSF d) EEG
 - ii) What is the volume fo packed red blood cells called ?
 - c) Answer the following : **(2×2=4)**
 - i) Explain in brief – defibrillation.
 - ii) State any four major sections in ECG wave.
-
2. Answer **any two** of the following : **(2×4=8)**
 - i) Explain with neat diagram micro-electrodes.
 - ii) Discuss the flame photometer.
 - iii) Explain the features of EEG waves.

P.T.O.



3. Answer **any two** of the following : **(2×4=8)**

- i) Discuss the requirements for internal electrodes.
- ii) With a neat block diagram, explain basic recording system.
- iii) Explain the reflex arc.

4. Answer **any two** : **(2×6=12)**

- i) Explain anatomy of heart.
- ii) Discuss physiological effects of electric currents.
- iii) Discuss macroshock hazards.

OR

4. Answer the following : **(3×4=12)**

- i) With a neat diagram explain spectrophotometer.
- ii) Explain the electrode for stimulation of tissues.
- iii) Discuss conductivity type blood cell counter.



State **true** or **false** :

- viii) The marketing mix component called *promotion* includes such items as product variety, design, packaging, services and warranties.
- ix) When a marketer makes decisions involving channels, assortments, locations and transportation, the marketer is making what are called *place decisions*.
- x) Wants are basic human requirements such as food or air.

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

10

- a) Define Marketing. What are four critical features of definition ?
- b) Enumerate any five disadvantages of equity capital as a source of finance to firm.
- c) Following data is extracted from the Balance Sheet of ABC Trader (Pvt.) Ltd. as at 31/03/2011.

(Rs. Lakhs)

Particulars	Amount (Rs.)
Electricity Bill to be paid	2.12
Payment to be made to suppliers	12.43
Long term loan from Bank	20.45
Owner's Equity	15.00
Finish goods Stock	8.68
Amount due from customers	16.02
Land, Building and Machinery	25.30

Calculate (All values in Rs. Lakhs) :

- a) Current assets
- b) Current liabilities
- c) Working capital



3. Attempt **any two** of the following : **10**
- a) Tabulate any five differences between private limited company and public limited company.
 - b) Enumerate any five methods for fixing price of a product.
 - c) Discuss any three merits and any two demerits of small scale industries.
4. Attempt **any one** of the following : **10**
- a) “Sole proprietorship is form of business organization in which an individual invests his own capital, uses his own skill and intelligence in the management of its affairs and is solely responsible for the results of its operations”. Elaborate the features, merits and demerits of his particular form of ownership structure.
 - b) “Marketing is a very important aspect in business since it contributes greatly to the success of the organization.” Explain with appropriate examples.



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T.Y. B.Sc. (Semester – IV) Examination, 2012
SEED TECHNOLOGY : BIOTECHNOLOGY AND INTELLECTUAL
PROPERTY RIGHTS
Vocational (Paper – VI) (2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat and labelled diagrams wherever necessary.*

1. Answer in **one** sentence each : **(1×10=10)**
- a) Write any two applications of biotechnology.
 - b) Give any two applications of PCR.
 - c) What is the use of DNA finger printing ?
 - d) Define micro propagation.
 - e) Give any two techniques used for variety identification.
 - f) Define Hardening of Plants.
 - g) Write any two branches of biotechnology.
 - h) What is meant by synthetic seeds ?
 - i) Define restriction enzymes.
 - j) What is patent ?
2. Answer the following (**any two**) : **(5×2=10)**
- a) Explain in detail-PCR.
 - b) Explain in brief-Anther culture.
 - c) Comment on World Trade Organization.

P.T.O.



3. Write notes on **any two** of the following : **(5×2=10)**

- a) Bt-cotton
- b) Seed storage proteins.
- c) Embryo culture.

4. Explain any two techniques employed in varietal identification in detail. **10**

OR

Explain in detail various steps involved in the micro propagation of Banana.
