

Total No. of Questions : 3]

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[3617]-131

S.Y. B.Sc. (Sem. - I)

मराठी (MARATHI)

विज्ञान कथा विश्व

वेळ : 2 तास]

[एकूण गुण : 40

सूचना :- 1) सर्व प्रश्न सोडविणे आवश्यक आहेत.

2) उजवीकडील अंक प्रश्नांचे पूर्ण गुण दर्शवितात.

प्रश्न 1) पुढीलपैकी कोणत्याही एका विषयावर 400 शब्दांपर्यंत निबंध लिहा.

[10]

- अ) भारताची चांद्रमोहीम
- ब) एकविसावे शतक आणि भारत
- क) पहाटेची भ्रमंती (ललित)

प्रश्न 2) बार्बिकेनने काढलेली अनुमाने 'चंद्रलोकची सफर' या कथेच्या आधारे सोदाहरण स्पष्ट करा. [15]

किंवा

बन्याबापूला यंत्रमानवाने दिलेली वागणूक 'यंत्रमानवाच्या हाताने' या कथेच्या आधारे विशद करा.

प्रश्न 3) टीपा लिहा. (कोणत्याही तीन)

[15]

- अ) 'कनेक्शन' कथेतील मिस्टर उदास.
- ब) डॉ. समीर सदावर्ते यांचे तरंगण्याचे स्वप्न.
- क) डॉ. विकास माटे यांचा मृत्यू.
- ड) डॉ. ऑर्थर ओहेनपीमर.
- इ) 'यंत्रांनी केलं बंड' मधील दीपक.
- फ) विज्ञान कथेची वैशिष्ट्ये.

Total No. of Questions : 3]

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[3617]-132

द्वितीय वर्ष विज्ञान (प्रथम सत्र)

S.Y. B.Sc. (Sem. - I)

हिंदी (Hindi)

(नया पाठ्यक्रम – 2008 पैटर्न)

समय : 2 घंटे]

[पूर्णांक : 40

पाठ्य-पुस्तकें :- i) *प्रतिनिधि कहानियाँ :*

हिंदी विभाग, एस.एन.डी.टी. विश्वविद्यालय, मुंबई।

ii) *छायावाद : प्रतिनिधि रचनाएँ :*

सम्पादक : नीरा परमार।

सूचनाएँ :- i) *सभी प्रश्न अनिवार्य हैं।*

ii) *दाहिनी ओर लिखे अंक प्रश्न के पूर्णांक हैं।*

प्रश्न 1. अ) निम्नलिखित में से किन्हीं दस वाक्यों को शुद्ध करके फिर से लिखिए :-

[10]

- 1) रमेश ने प्रेमचंद की उपन्यास पढ़ी है।
- 2) हमारे गाँव में बाढ़ आया था।
- 3) शेर ने हिरन की शिकार की।
- 4) पोलिस ने चोर को पकड़ा।
- 5) मंदिर के निर्माण का कार्य पूरी हो गयी है।
- 6) चीता बहोत तेज दौड़ता है।
- 7) अपने गुरु के ऊपर श्रद्धा रखनी चाहिए।
- 8) तुने मुझे अपनी शादी में बुलायाच नहीं।
- 9) सभा में अनेक श्रोते आए थे।
- 10) मोहन को पीताजी ने डाँटा।
- 11) हमारा दफ्तर साढ़े दस बजे खुलता है।
- 12) ग्यारा बजे तुम आ जाना।

P.T.O.

आ) निम्नलिखित अंग्रेजी अनुच्छेद का हिंदी में अनुवाद कीजिए :- [4]

When light propagates through a medium it sets the particles of ether in to vibrations. Since light is a transverse wave the direction of vibration is perpendicular to the direction of propagation. Imagine a horizontal plane in which two light beams of same wavelength and same intensity are travelling. At some point their paths will cross.

प्रश्न 2. अ) निम्नलिखित गद्य अवतरण की ससंदर्भ व्याख्या कीजिए :- [5]

(क) तीन ही तो रुपये हैं, दे दोगे तो कम्मल कहाँ से आवेगा ? माघ-पूस की रात हार में कैसे कटेगी। उससे कह दो, फसल पर रुपये दे देंगे। अभी नहीं।

अथवा

(क) कौन बड़ी रकम थमा देते हो ? दो रूपलपी किराया और वह भी छह-छह महीने का बकाया। जानते हो लकड़ी का क्या भाव है ? न हो मकान छोड़ जाओ।

आ) निम्नलिखित पद्य अवतरण की ससंदर्भ व्याख्या कीजिए :- [5]

(ख) आँखें अलियों-सी
किस मधु की गलियों में फँसीं
बंद कर पाँखें
पी रही हैं मधु मौन
अथवा सोई कमल-कोरकों में ?

अथवा

(ख) जग पीड़ित है अति-दुख से
जग पीड़ित रे अति-सुख से
मानव-जग में बँट जावें
दुख सुख से औ' सुख दुख से।

प्रश्न 3. अ) निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर लिखिए :- [8]

- (च) जमींदार ने विधवा स्त्री की झोपड़ी क्यों लौटा दी ?
- (छ) 'उसने कहा था' कहानी के अमृतसर के इक्केवालों की बोली का परिचय दीजिए।
- (ज) 'गुण्डा' कहानी के नन्हकूसिंह का चरित्रांकन कीजिए।
- (झ) सुनन्दा अपने पति से नाराज क्यों हो जाती है ?

आ) निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर लिखिए :- [8]

- (प) 'जुही की कली' कविता में कवि ने प्रकृति का मानवीकरण किस प्रकार किया है ?
- (फ) 'एक बार बस और नाच तू श्यामा' ऐसा कवि क्यों कहता है ?
- (ब) 'नौका विहार' कविता का भावार्थ संक्षेप में स्पष्ट कीजिए।
- (भ) कवि पंत ने धरती का महत्व कैसे दर्शाया है ?

Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617]-133

S.Y. B.Sc.

SANSKRIT (संस्कृत)

गीर्वाणभारती

(Semester - I) (New)

Time : 2 Hours]

[Max. Marks : 40

Q1) Write short answers in 2-4 lines of the following questions.

[16]

पुढील प्रश्नांची 2-4 ओळींमध्ये उत्तरे लिहा.

i) What did शर्यात say to च्यवन ?

शर्यात च्यवनाला काय म्हणाला ?

ii) Write the conclusion of सत्यकामजाबाल story.

सत्यकामजाबालकथेचे तात्पर्य लिहा.

iii) How many काण्ड's of रामायण and what are they?

रामायणाची किती कांडे आहेत व ती कोणती ?

iv) From which drama the lesson 'सेयं याति शकुन्तला पतिगृहम्' is taken and who is the author of that drama?

'सेयं याति शकुन्तला पतिगृहम्' हा पाठ कोणत्या नाटकातून घेतला आहे आणि त्या नाटकाचा कर्ता कोण ?

v) Write the importance of मानसपूजा.

मानसपूजेचे महत्त्व लिहा.

vi) Explain the meaning of 'क्षमिणा पुरुषेण भवितव्यम् ।'

'क्षमिणा पुरुषेण भवितव्यम्' या वाक्याचा अर्थ स्पष्ट करा.

vii) What did अश्विनीकुमार say to सुकन्या ?

अश्विनीकुमार सुकन्येला काय म्हणाले ?

viii) What is the purpose of poetry 'शतोपदेशप्रबन्धः'?

'शतोपदेशप्रबन्धः' या काव्यग्रंथाचे प्रयोजन कोणते ?

P.T.O.

Q2) Write short notes on any two of the following in 8 - 10 lines each. **[8]**

पुढीलपैकी कोणत्याही दोहोंवर संक्षिप्त टीपा लिहा. (8 ते 10 ओळीत)

- i) शिवमानसपूजा.
- ii) श्रयेन्महान्तं महत्त्वाय ।
- iii) सिंहिका.

Q3) Write short notes on any two of the following in 8 - 10 lines each. **[8]**

पुढीलपैकी कोणत्याही दोहोंवर संक्षिप्त टीपा लिहा. (8 ते 10 ओळीत)

- i) Character of शर्यात king.
शर्यातराजाचे व्यक्तिचित्रण.
- ii) Character of सत्यकाम.
सत्यकामाचे व्यक्तिचित्रण.
- iii) सुभाषित's in the lesson of 'सेयं याति शकुन्तला पतिगृहम्'.
'सेयं याति शकुन्तला पतिगृहम्' या पाठातील सुभाषिते.

Q4) Answer any one of the following questions in 16 - 20 lines. **[8]**

पुढीलपैकी कोणत्याही एका प्रश्नाचे उत्तर 16 ते 20 ओळींमध्ये लिहा.

- i) Explain the advises in 'उपदेशप्रबन्धः'.
'उपदेशप्रबन्धः' या पाठात आलेले उपदेश कथांच्या द्वारा स्पष्ट करा.
- ii) Write the story of च्यवनभार्गव with its importance.
च्यवनभार्गवकथा सतात्पर्य लिहा.



Total No. of Questions : 6]

[Total No. of Pages : 2

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[3617]-149

S.Y. B.Sc. (Sem. - I)

URDU GENERAL

(Paper - II) (2008 Pattern)

Time : 3 Hours]

[Total Marks : 80

Instructions :

- 1) Attempt all questions.
- 2) Figures to the left indicate full marks.

[20] سوال نمبر ۱۔ اقبال کی شاعری کی خصوصیات بیان کیجیے

[20] اقبال نے اپنے کلام میں کونسا پیغام دیا ہے ؟
سوال نمبر ۲:- ”ہمالہ“ اسی نظم کی شاعرانہ خوبیاں بیان کیجیے

[20] ”ترانہ مہدی“ میں اقبال نے ہندوستان کی تعریف کن الفاظ میں کی ہے ؟
سوال نمبر ۳:- منشی پریم چند کی طرز تحریر کی خوبیاں بیان کیجیے۔

[5] منشی پریم چند کے افسانوں میں کونسے سماجی
مسائل پیش کیے گئے ہیں ؟
سوال نمبر ۴ (الف) کوئی پانچ سابقے یا لائقے کی مدد سے

[5] الفاظ (بامعنی) تیار کیجیے
بے، با، نا، کھا، ”اثر“ باز، اندلسی
سوال نمبر ۵ (ب) جملہ کی قسمیں مع مثالوں کے تفصیل سے
بیان کیجیے۔

P.T.O.

سوال نمبر ۵ :- مندرجہ ذیل انگریزی الفاظوں کیلئے اردو مترادف
الفاظ لکھیے (کوئی ۱۰)

[10]

- | | |
|------------------------|--------------------|
| 1) Boiling point | 2) Voltage |
| 3) Density | 4) Vaccine |
| 5) Convection | 6) Mixture |
| 7) Radiation | 8) Freezing point |
| 9) Reflection of light | 10) Biomass |
| 11) Haemophilia | 12) Micro Organism |



Total No. of Questions : 3]

[Total No. of Pages : 1

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[3617]-182

S.Y. B.Sc. (Sem. - I)

मराठी (MARATHI)

विज्ञान कथा विश्व

वेळ : 2 तास]

[एकूण गुण : 40

सूचना :- 1) सर्व प्रश्न सोडविणे आवश्यक आहेत.

2) उजवीकडील अंक प्रश्नांचे पूर्ण गुण दर्शवितात.

प्रश्न 1) पुढीलपैकी कोणत्याही एका विषयावर 400 शब्दांपर्यंत निबंध लिहा.

[10]

- अ) जागतिक तापमान : एक प्रश्न
- ब) आधुनिक ज्ञानप्रसाराची साधने
- क) माणूसपण हरवते तेव्हा..... (ललित)

प्रश्न 2) “यंत्र कधीही माणसांची जागा घेऊ शकणार नाहीत”. या विधानाचा आशय ‘यंत्रांनी केलं बंड’ या कथेच्या आधारे सोदाहरण विशद करा.

[15]

किंवा

‘चंद्रलोकची सफर’ या कथेमधील वैज्ञानिक सत्य स्पष्ट करा.

प्रश्न 3) टीपा लिहा. (कोणत्याही तीन)

[15]

- अ) ‘वामलोचना’ सिद्धांतासंबंधी विश्वनाथपंतानी दिलेली प्रमाणे.
- ब) ‘अंतराळातील मृत्यू’ मधील डॉ.विकास माटे.
- क) विज्ञान-कथेतील वास्तव.
- ड) ‘गुगली’ कथेतील सुनीलची मानसिकता.
- इ) ‘आकाश आणि जमीन’ या शीर्षकाची समर्पकता.
- फ) ‘कनेक्शन’ कथेतील पी.पी. उदास.

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[3617] - 22

F.Y. B.Sc.

ELECTRONIC SCIENCE - II

EL2 - T2 : Principles of Digital Electronics

(Paper - II) (New Course)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

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

Q1) Answer the following questions in brief.

[8 × 2 = 16]

- a) Draw symbol of NOR gate and write its truth table.
- b) Draw the logic circuit for OR gate using only NAND gates.
- c) State the rules of binary addition and subtraction.
- d) Write application of Multiplexer.
- e) Draw the symbol of JK flip-flop and write its truth table.
- f) What are ASCII code and EBCDIC codes?
- g) What do you mean by SSI and VLSI?
- h) What is non volatile memory?

Q2) Answer the following (any four)

[4 × 4 = 16]

- a) Convert $(31.50)_{10} = (\quad)_2$ and $(374)_8 = (\quad)_{10}$.
- b) Explain how EX-OR gate can work as parity generator.
- c) Describe the function of Half adder with its logic diagram and truth table.
- d) What is Demultiplexer? Draw and explain 1:4 Demultiplexer.
- e) What is modulus counter? Draw the logic circuit of Mod-7 counter. Explain its action.
- f) Explain the action of open collector TTL two input NAND gate.

P.T.O.

Q3) Answer the following (any four)

[4 × 4 = 16]

- a) Draw logic diagram of two Input AND gate using diodes. Explain its action.
- b) State and prove De-Morgan's second theorem and also draw necessary logic gates.
- c) With the help of universal adder/subtractor. Explain binary subtraction with circuit diagram.
- d) Explain the working of R-S Flip-Flop with logic diagram and truth table.
- e) With the help of logic diagram and truth table. Describe action of decimal to BCD encoder.
- f) Explain the terms:-
 - i) Speed of operation.
 - ii) Power dissipation.

Q4) Answer any two of the following.

[2 × 8 = 16]

- a)
 - i) Explain the structural organization memory.
 - ii) Explain the operation of SISO shift register.
- b)
 - i) Design 4:1 multiplexer using 2:1 multiplexer.
 - ii) Perform given subtraction using direct method, 1's complement and 2's complement method. (45 – 12).
- c)
 - i) Simplify the following boolean equation and write its equation and draw its equivalent logic diagram
$$Y = AB + BC + \overline{B}A + \overline{A}B.$$
 - ii) Draw the logic diagram and timing diagram for 4 bit Asynchronous Counter.

Q5) Answer any two of the following.

[2 × 8 = 16]

- a)
 - i) Write a short notes on seven segment display.
 - ii) Explain the logic diagram of 4bit ring counter with its action.
- b)
 - i) Simplify the following Boolean equation using K-map and then draw logic diagram
$$Y = AB\overline{C} + ABC + BC.$$
 - ii) Write short notes on erasable and nonerasable memory.
- c)
 - i) Explain basic CMOS inverter circuit.
 - ii) Convert the following
 - A) $(110010101110)_2 = (\quad)_{16}$
 - B) $(11011)_2 = (\quad)_{10} = (\quad)_8.$



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[3617] - 122

S.Y. B.Sc.

STATISTICAL TECHNIQUES

STT - 212: Statistical Techniques - II

(Sem. - I) (New Course) (Paper - II)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of calculator and statistical table is allowed.
- 4) Symbols and abbreviations have their usual meanings.

Q1) Attempt each of the following:

- a) Choose the correct alternative in each of the following: **[1 each]**
 - i) Consumer's risk is the probability of
 - A) Accepting a lot of good quality.
 - B) Rejecting a lot of good quality.
 - C) Accepting a lot of bad quality.
 - D) Rejecting a lot of bad quality.
 - ii) From a population consisting of 10 units, the number of samples of size 3 by the procedure of SRSWR are
 - A) 120
 - B) 1000
 - C) 100
 - D) 30
 - iii) In a double sampling plan $\{N, n_1, n_2, c_1, c_2\}$ suppose number of defectives in the first sample is d_1 and that in the second sample is d_2 . The lot is rejected on the basis of two samples if and only if
 - A) $d_2 > c_2$
 - B) $d_1 + d_2 > c_1$
 - C) $d_1 + d_2 > c_1 + c_2$
 - D) $d_1 + d_2 > c_2$

P.T.O.

- b) State whether the given statement is true or false in each of the following: **[1 each]**
- The value of AQL always lies between 0 and 0.5.
 - The standard error of estimator of population mean under SRSWOR is $\frac{N-n}{N} \cdot \frac{S^2}{n}$.
 - Proportional allocation is special case of optimum allocation.
- c) Give one real life situation where stratified random sampling is used. **[1]**
- d) From a basket containing 100 apples, a simple random sample of 10 apples is drawn. The mean of the sample of apples is observed to be 120 gm. Estimate the total weight of apples in the basket. **[1]**
- e) What is acceptance sampling? **[1]**
- f) Compute Probability of rejecting the lot for single sampling plan $\{N, n = 50, c = 1\}$ if lot is of AQL 1%. (Assume N to be large). **[1]**

Q2) Attempt any two of the following: **[5 each]**

- Explain the term 'sampling for proportion'. Give one real life situation suitable for it. State estimator of the population proportion and the expression for its standard error in case of SRSWOR.
- Compute ATI for the single sampling plan $\{N = 1000, n = 40, c = 2\}$ if lot is of AQL 2%. Also compute the consumer's risk if LTPD = 0.05.
- Discuss the problem of allocation in stratified random sampling. State the strata sample size under optimum allocation. Derive the expression for standard error of estimator of population total when optimum allocation is used.

Q3) Attempt any two of the following: **[5 each]**

- Define AOQ and AOQL. Describe how to determine AOQL graphically. Determine AOQ for single sampling plan $\{N = 1000, n = 100, c = 1\}$ assuming N large if the lot is of AQL 1%.
- A simple random sample of 10 households was drawn from a locality of 150 households. The number of children below the age 12 years is recorded for the households in the sample as follows:
0, 2, 1, 2, 3, 1, 1, 1, 0.
Estimate the total number of children below age 12 years in this locality. Also find the estimate of standard error of this estimate.
- Explain the construction of OC curve in double sampling plan. Also discuss the uses of OC curve.

Q4) Attempt any one of the following:

- a) i) Describe the working of double sampling plan. Also state the expression for AOQ in double sampling plan. [5]
- ii) In a population of size $N = 5$, the values of an observable random variable are 2, 8, 5, 7, 5. Calculate sample mean \bar{Y} for all possible samples of size 2 by SRSWOR. Verify that \bar{Y} is an unbiased estimator of \bar{Y} (Population Mean). [5]
- b) i) Explain the terms : [5]
- A) Producer's Risk.
- B) Lot tolerance fraction defective (LTFD).
- ii) A Sample of 40 students is to be drawn from a population consisting of 300 students belonging to two colleges A and B. The mean, standard deviation of marks obtained by students and number of students in the college (N_i) are given below: [5]

College	Total number of students (N_i)	Mean (\bar{y}_{N_i})	Standard deviation (σ_i)
A	200	65	20
B	100	75	10

Draw the sample using:

- A) Proportional allocation.
- B) Optimum allocation.



P583

[3617] - 163
S.Y. B.Sc.
GEOLOGY
GL- 212 : Structural Geology
(Old Course) (Sem. - I)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

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

Q1) Answer the following questions in two or three lines. **[10]**

- a) Define Bearing of a linear feature.
- b) Define the term 'shift' along the fault.
- c) Define couple.
- d) What are bedding joints?
- e) Define chevron fold.
- f) What are 'Inliers'?
- g) Give an example of rock showing columnar Joint.
- h) Define Reverse fault.
- i) What is depression?
- j) Define structural terrace.

Q2) Write notes on (Any Two) **[10]**

- a) Extension and Release joints.
- b) Determination of top of bed with help of graded bedding.
- c) Representation of folds.

Q3) Explain the following (Any Two) **[10]**

- a) Classification of faults based on attitude of the fault and affected beds.
- b) Stages in development of an unconformity.
- c) Drag folds.

Q4) What are faults? Explain the translational and rotational movement along the fault. **[10]**

OR

Define unconformity. Explain the criteria for distinguishing unconformity with faults.



P584**[3617] - 164****S.Y. B.Sc.****STATISTICS****ST - 211 : Discrete Probability Distributions and Time Series****(Sem. - I) (Old Course) (Paper - I)*****Time : 2 Hours]******[Max. Marks :40******Instructions to the candidates:***

- 1) All questions are compulsory.***
- 2) Figures to the right indicate full marks.***
- 3) Use of calculator and statistical tables is allowed.***
- 4) Symbols and abbreviations have their usual meanings.***

Q1) Attempt each of the following:

- a) Choose the correct alternative in each of the following: **[1each]**
 - i) Which of the following sample spaces is countably infinite?
(A) $\{x : x \in \mathbb{R} \text{ and } 1 \leq x \leq 5\}$
(B) $\{x : x \in \mathbb{N} \text{ and } 1 \leq x \leq 5\}$
(C) $\{x : x \in \mathbb{R} \text{ and } x \geq 5\}$
(D) $\{x : x \in \mathbb{N} \text{ and } x \geq 5\}$
 - ii) If $M_x(t)$ and $P_x(s)$ are (M.G.F.) and (P.G.F.) respectively of a discrete random variable X then
(A) $M_x(t) = P_x(e^t)$
(B) $M_x(e^t) = P_x(t)$
(C) $M_x(t) = P_x(\log t)$
(D) $M_x(\log t) = P_x(e^t)$
 - iii) A poisson r.v. X has maximum probability at $X = 3$ and $X = 4$. The third cumulant of X is equal to
(A) 3
(B) 4
(C) $\frac{3}{4}$
(D) $\frac{4}{3}$

- b) State whether the given statement is true or false in each of the following: **[1 each]**
- The cumulative distribution function (c.d.f.) of a discrete r.v. X has jumps at each value of the r.v.
 - If X and Y are independent Poisson random variables then $(X - Y)$ is also a Poisson random variable.
 - Negative binomial distribution is positively skewed and platykurtic.
- c) Define median of a discrete r.v. X . **[1]**
- d) Define expectation of a function of a two-dimensional discrete r.v. (X, Y) . **[1]**
- e) State recurrence relation for probabilities of geometric distribution. **[1]**
- f) State the multiplicative model in the analysis of time series. **[1]**

Q2) Attempt any two of the following: **[5 each]**

- Show that all cumulants, except the first, are invariant to the change of origin but not to the change of scale.
- Obtain mean and variance of Poisson distribution with parameter M .
- At a traffic check post, 20% of the vehicles are found to be out of state. Find the probability that on a particular day tenth vehicle will be found to be the third vehicle which is out of state. Also find the expected number of failures before getting third out of state vehicle.

Q3) Attempt any two of the following: **[5 each]**

- If X and Y are independent Poisson random variables with parameters 2 and 3 respectively, find
 - $P(X + Y < 2)$ and
 - $P(X = 1 \mid X + Y = 3)$.
- Obtain M.G.F. of geometric distribution defined on non-negative integer values. Hence find the distribution of $\sum_{i=1}^k X_i$ where X_1, X_2, \dots, X_k are i.i.d. geometric random variables taking non-negative integer values.
- The joint p.m.f. of two -dimensional discrete r.v. (X, Y) is

$$p(x, y) = \frac{1}{2^{x-1} 3^y}, x = 1, 2, 3, \dots$$

$$y = 1, 2, 3, \dots$$

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

- Find the marginal distributions of X and Y .
- Verify whether X and Y are independently distributed.

Q4) Attempt any one of the following:

- a) i) What is a time series? Give two illustrations of time series. Discuss cyclical and irregular variations in time series. [6]
ii) The p.m.f. of a discrete r.v. X is

$$p(x) = \frac{k}{x(x+1)}, x = 1, 2, 3, \dots$$

Find the value of the constant k and E(X) if it exists. [4]

- b) i) State and prove lack of memory property of geometric distribution. [5]
ii) Describe the method of moving averages for the estimation of secular trend. Discuss its merits and demerits. [5]



P654

[3617] - 167

S.Y. B.Sc.

GEOGRAPHY

Gg - 212: Plant Geography

(Sem. - I) (Paper - II) (Old 2005 Pattern)

Time :2 Hours]

[Max. Marks :40

Instructions to the candidates:-

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of map stencil is allowed.*

Q1) Answer the following questions in two or three sentences each: **[10]**

- a) What is meant by specific zero?
- b) Write two names of climatic factors affecting plant growth.
- c) Give two examples of xerophytes.
- d) Write two characteristics of hydrophytes.
- e) Give two examples of geophytes.
- f) Give two examples of aesthetic plants.
- g) Write two names of plant species in the gangetic plain.
- h) Give two examples of parasitic plants.
- i) What do you mean by edaphic?
- j) Give two examples of plant species in Northern Africa phytogeographic region.

Q2) Write short notes any Two of the following: **[10]**

- a) Oxygen cycle.
- b) Aquatic plant communities.
- c) Lichens.

Q3) Answer any Two of the following questions: **[10]**

- a) Explain the physiographic factors affecting plant growth.
- b) Describe the environmental significance of plants.
- c) Describe the Tropical rain forest biomes.

Q4) Define plant Geography. Explain the nature and scope of plant Geography. **[10]**

OR

Write in detail the Raunkiaer's classification of plants.



Total No. of Questions : 4]

[Total No. of Pages : 2

P656

[3617] - 192
S.Y. B.Sc. (Vocational)
SEED TECHNOLOGY
Hybrid Seed Production
(Sem. - I) (Paper - III) (Old)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

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

Q1) Attempt the following:

[10 × 1 = 10]

- a) What is inbreeding depression?
- b) Enlist the kinds of incompatibility.
- c) Give any two roles of haploid breeding.
- d) Write any two advantages of male sterility.
- e) What is maintainer line?
- f) Define pollen shedders.
- g) What is meant by pollination?
- h) Define Roughing.
- i) Give isolation requirement for hybrid seed production of maize.
- j) What is planting ratio?

Q2) Attempt any two of the following:

[2 × 5 = 10]

- a) Explain biochemical basis of heterosis?
- b) What is genetic male sterility? Give its advantages and disadvantages.
- c) Give the difference between sterility & incompatibility.

P.T.O.

Q3) Write short notes on any two of the following. **[2 × 5 = 10]**

- a) Gametocides and their use in hybrid seed production.
- b) Border rows.
- c) Maintenance of seed parent - cotton.

Q4) Give in detail procedure of hybrid seed production in sorghum. **[10]**

OR

Give in detail procedure of hybrid seed production in pearl millet.



Total No. of Questions : 4]

[Total No. of Pages : 2

P657

[3617] - 199
S.Y. B.Sc. (Vocational)
SEED TECHNOLOGY
Seed Testing
(Sem. - I) (Paper - IV) (Old)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

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

Q1) Attempt the following:

[10 × 1 = 10]

- a) What is seed testing?
- b) Enlist different types of seed dividing equipments.
- c) Define hard seed.
- d) What is meant by other crop seed?
- e) What is abnormal seeding?
- f) Define seed vigour.
- g) Enlist different types employed in moisture testing.
- h) What are pellets?
- i) Enlist different international organizations engaged in seed testing.
- j) What are triers?

Q2) Attempt any two of the following:

[2 × 5 = 10]

- a) Describe any two seed testing laboratory equipments & their maintenance.
- b) Describe TZ method for germination testing.
- c) Explain any one method for testing pelleted seeds.

P.T.O.

Q3) Write short notes on any two of the following.

[2 × 5 = 10]

- a) Heterogeneity test.
- b) Sample registration.
- c) Storage of guard sample.

Q4) What is moisture percentage? Give in detail any one method of moisture testing **[10]**

OR

What is seed germination? Describe in detail any one method used in seed germination testing.



P159**[3617] - 204****S.Y. B.Sc.****PHYSICS****PH - 221 : Oscillations, waves and sound****(Sem.- II) (Paper - I)***Time : 2 Hours]**[Max. Marks : 40**Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and log table is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of the following :

- a) Explain the terms i) Stable equilibrium ii) Neutral equilibrium. [1]
- b) Distinguish between damped and undamped oscillations. [1]
- c) What is a resonance? State the condition for velocity resonance. [1]
- d) A pan attached to a spring balance has a mass of 1 kg. A weight of 2 kg when placed on the pan compresses the spring by 0.14 m. What is the force constant of the spring? [1]
- e) Explain the term - width of spectral line. [1]
- f) The equation of critically damped motion of an oscillator is given by
$$m \frac{d^2x}{dt^2} + 20 \frac{dx}{dt} + 25x = 0.$$
Determine the value of m. [1]
- g) What is reverberation? [1]
- h) The equation of forced oscillations of a body is given by
$$\frac{d^2x}{dt^2} + 4 \frac{dx}{dt} + 400x = 16 \sin qt$$
Determine quality factor. [1]
- i) What are s - waves? [1]
- j) Define intensity of wave. Give its SI unit. [1]

P.T.O.

Q2) Attempt any two of the following :

- a) What are Lissajous figures? Explain the optical method for obtaining the Lissajous figures. [5]
- b) What is meant by amplitude resonance? Derive the condition for amplitude resonance and obtain amplitude at the resonance. [5]
- c) Define the log decrement. Derive the expression for it. [5]

Q3) Attempt any two of the following :

- a) The two S.H.Ms acting on the particle simultaneously are given as $x = a \sin 3\omega t$ and $y = a \sin \omega t$. Find the equation of resultant path. [5]
- b) The displacement time equation of an oscillator executing a damped oscillatory motion is

$$x = a e^{-2t} \sin (4t + \theta)$$

Where a and θ are constants. If its initial displacement and the velocity are 8 and -16 units respectively, determine the values of constants. [5]

- c) The equation of forced oscillations of an oscillator is given by

$$4 \left(\frac{d^2 x}{dt^2} \right) + 4 \left(\frac{dx}{dt} \right) + 144 x = 25 \sin 4t$$

Determine the resonant frequency at which velocity resonance takes place. Also determine quality factor at resonance and half width. [5]

Q4) Attempt the following :

- a) i) Prove that the velocity of transverse waves over a string of linear density μ is

$$C = \sqrt{\frac{T}{\mu}}, \text{ where } T \text{ is tension.} \quad [4]$$

- ii) Show that the apparent wavelength of light decreases when the star moves towards the earth. [4]

OR

- i) What do you mean by wave velocity and particle velocity? Show that wave velocity

$$C = \frac{w}{k}$$

Where symbols have their usual meaning. [4]

- ii) Describe Rayleigh disc method for the measurement of sound intensity. [4]

b) Attempt any one of the following :

- i) A train with the whistle on approaches a station at a speed of 32 m/s. The frequency of the whistling sound from the engine is 800 Hz. Determine the apparent change in the frequency of sound as heard by a listener standing on the platform. Assume that air is at rest and the speed of sound in air is 332 m/s. [2]
- ii) A stroboscopic disc with 16 spots equally spaced is seen through the movable slit fixed to the prongs of tuning fork. The spots appeared stationary when disc was making 128 revolutions in 4 seconds after gradually increasing the speed. Determine the frequency of the fork. [2]



P161

[3617] - 206
S.Y. B.Sc.
CHEMISTRY - I
CH - 221 : Inorganic Chemistry
(Sem. - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

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

Q1) Answer the following :

[10]

- a) What do you mean by refining of metals?
- b) What is role of AlF_3 in refining of Aluminium?
- c) What is pig iron?
- d) What is inert pair effect?
- e) List some toxic compounds in the environment.
- f) What do you mean by autodissociation of solvent?
- g) Alcohols are highly soluble in water. Explain.
- h) Explain the term paramagnetism.
- i) What are plant nutrients?
- j) What is significance of K_a and K_b ?

Q2) Attempt any two of the following :

[10]

- a) Write the names, symbols and electronic configurations of oxygen family elements. Explain the trends in the following properties of these elements :
 - i) Oxidation state and
 - ii) Reactivity
- b) Explain the trends in the strength of hydracids and oxyacids.
- c) Answer the following :
 - i) How metals occurs in the nature? Define and differentiate the terms ore and mineral. What are different types of ore?
 - ii) Explain biochemical effects of Arsenic.

P.T.O.

Q3) Attempt any two of the following : **[10]**

- a) Explain the experimental method for the measurement of magnetic susceptibility. Show that, how this method is useful to find out number of unpaired electrons?
- b) Explain the metallurgy of Aluminium with special reference to
 - i) Physico-chemical principles and
 - ii) Anode effect.
- c) Answer the following :
 - i) Explain any two factors that affect the strength of Vander Waal forces. Illustrate with suitable examples.
 - ii) Write a brief note on air pollution and air quality standards.

Q4) a) Attempt any one of the following : **[6]**

- i) What are the products of Blast Furnace? Explain in brief manufacture of wrought iron from cast iron.
 - ii) What is steel? How it is made from cast iron by acid Bessemer's process? What are the advantages of Bessemer's process?
- b) Attempt any one of the following : **[4]**
- i) What is anomalous behaviour? Explain your answer with special reference to Boron.
 - ii) Explain the concept of conjugate acid-base pair. Support your answer giving suitable examples.



P162

[3617] - 207

S.Y. B.Sc.

CHEMISTRY

CH - 222 : Analytical Chemistry - II

(21322) (Sem. - II) (Theory)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables and calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following :

[10]

- a) Define the term flux with example.
- b) Which is the group reagent for IVth group?
- c) Draw a labelled diagram of wheat stone's bridge circuit.
- d) Define the term absorbance in colorimeter.
- e) What is mean by qualitative analysis?
- f) Define the term Accuracy.
- g) What is the neutralization point of a titration?
- h) Give the relation between molecular formula and empirical formula.
- i) What is mean by elution in column chromatography?
- j) Give any two requirements of a primary standard substance.

Q2) a) Answer any two of the following :

[6]

- i) Explain the term 'solubility product'. Give its two applications in qualitative analysis.
 - ii) What do you understand by the term significant figures? Explain it with suitable example.
 - iii) What is the chromatography? Give the classification of chromatography.
- b) The observed resistance of 0.1 N KCl solution was found to be 370.5 ohm at 25°C. A 0.1 N solution of another electrolyte in the same cell had a resistance of 925 ohms. Calculate the equivalent conductance of solution. (Given : Specific conductance of 0.1 N KCl solution at 25°C = 0.002765 ohm⁻¹ cm⁻¹).

[4]

P.T.O.

- Q3)** a) Answer any two of the following : **[6]**
- i) Discuss the removal of phosphate ion using ferric chloride method.
 - ii) Explain the 'Kjeldahl's method' for the estimation of nitrogen in organic compounds.
 - iii) Explain the displacement titration with suitable example.
- b) Solve any one : **[4]**
- i) 0.414 gm of an organic compound on analysis gave 0.144 gm of barium sulphate. Calculate the percentage of sulphur in the compound.
 - ii) The emf of a cell was measured by four students. The results were 0.340V, 0.345V, 0.348V and 0.350V. Calculate mean deviation and relative mean deviation.
- Q4)** Attempt any two of the following : **[10]**
- a) Describe the essential components of a colorimeter with diagram. Give the function of each component.
 - b) Explain the titration curve for weak acid and strong base in volumetric analysis.
 - c) What is deionised water? Explain the method of purification of water by ion exchange resins and give its uses.



P163

[3617] - 208

S.Y. B.Sc.

BOTANY

BO - 221 : Plant Biotechnology

(Paper - I) (Sem. - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

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

Q1) Attempt the following :

[10]

- a) Mention any two organisms involved in fermentation.
- b) Define biotechnology.
- c) What are hazardous wastes?
- d) Define biofuel.
- e) What is Callus?
- f) What is plasmid?
- g) Enlist two types of cultures in fermentation.
- h) What is incubation?
- i) What is recombinant DNA technology?
- j) What is industrial biotechnology?

Q2) Answer any two of the following :

[10]

- a) Describe the design, operation and organisms involved in biogas production.
- b) Explain the concept of reusing and recycling.
- c) Give the applications of genetic engineering.

P.T.O.

Q3) Write short notes (any two) :

[10]

- a) Advantages and disadvantages of biofuels.
- b) Biological composting.
- c) Restriction endonucleases.

Q4) Define biofertilizer. Describe the method of mass production of *Rhizobium* biofertilizer.

[10]

OR

What is fermentation? Describe the steps involved in manufacture of citric acid.



P164

[3617] - 209

S.Y. B.Sc.

BOTANY

BO - 222 : Plant Physiology

(Paper - II) (Sem. - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

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

Q1) Attempt the following :

[10]

- a) What is Osmosis?
- b) Give any two applications of plant physiology.
- c) Define plant growth.
- d) Give one difference between transpiration and guttation.
- e) What is vernalization?
- f) Name any two factors affecting salt absorption.
- g) Which type of water is the major source of water for plants.
- h) Define phytohormones.
- i) Name any two major elements.
- j) What is an antitranspirant?

Q2) Answer any two of the following :

[10]

- a) Discuss the role and deficiency symptoms of potassium.
- b) Explain the active absorption of salts by cytochrome pump theory.
- c) Describe any five practical applications of auxins.

P.T.O.

Q3) Write short notes on any two of the following : **[10]**

- a) Foliar nutrition.
- b) Root pressure theory.
- c) Diffusion pressure deficit.

Q4) Explain the importance of water in plant life and add a note on the factors affecting water absorption **[10]**

OR

What is photoperiodism? Enlist various classes of plants on the basis of photoperiod and explain any one of them in brief.



P165

[3617] - 210

S.Y. B.Sc.

ZOOLOGY (P - I)

ZO - 221 : Animal Systematics and Diversity

(Paper - I) (Sem. - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

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

Q1) Attempt the following :

[10]

- a) Enlist any two degenerative characters of cyclostomata.
- b) Define agnatha.
- c) State any two general characters of class-Reptilia.
- d) What is protocercal fin.
- e) Name the amphibian female carrying eggs around her neck.
- f) Define anadromous migration.
- g) Give the function of scroll valve.
- h) Mention biological name of Indian cobra.
- i) Give names of any two cavities of brain of Scoliodon.
- j) Mention the name of 1st cranial nerve.

Q2) Write short notes on (any two) :

[10]

- a) Membranous labyrinth.
- b) Ganoid and cycloid scales.
- c) Parental care in Alytes and Pipa.

P.T.O.

Q3) Attempt the following (any two) : **[10]**

- a) Explain anapsid and synapsid skull in reptiles.
- b) Sketch and label V.S. of heart of Scoliodon.
- c) Explain digestive glands of Scoliodon.

Q4) Give an account of external characters of Scoliodon. Add a note on its habit and habitat. **[10]**

OR

With suitable examples, describe in detail the distinguishing characters of poisonous and non-poisonous snakes.



P166

[3617] - 211

S.Y. B.Sc.

ZOOLOGY (P - II)

ZO - 222 : Applied Zoology

(Apiculture, Sericulture and Vermiculture)

(Paper - II) (Sem. - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

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

Q1) Attempt the following :

[10]

- a) Define the term Vermiculture.
- b) What is scientific name of rock bee?
- c) Give the meaning of hibernating eggs.
- d) What is the use of bee-brush?
- e) Define the term bivoltine.
- f) Write the name of bacterium which causes American foul brood disease.
- g) Define the term absconding.
- h) What is pruning?
- i) Enlist any two factors affect the culturing of earthworms.
- j) What is bee-bread?

Q2) Write short notes on (any two) :

[10]

- a) Economic importance of honey.
- b) Useful earthworm species.
- c) Chandrika.

P.T.O.

- Q3)** Attempt the following (any two) : **[10]**
- a) Silkworm rearing methods.
 - b) Explain symptoms and control measures of AFB disease.
 - c) Economic importance of bee venom and royaljelly.

Q4) Describe in detail seasonal management of bee colonies. **[10]**

OR

What is bed cleaning? Describe the different methods of bed cleaning.



Total No. of Questions : 4]

[Total No. of Pages : 2

P167

[3617] - 212

S.Y. B.Sc.

GEOLOGY - I

GL - 221 : Petrology

(Paper - I) (Sem. - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:-

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

Q1) Answer the following questions :

[10]

- a) Define metastable region of crystallisation.
- b) Name any two minerals of low silication.
- c) What are metasilicates?
- d) Name the texture of igneous rocks consisting of subhedral mineral grains.
- e) Draw a figure of discordant bedding.
- f) Define diagenesis.
- g) Name any two arenaceous rocks.
- h) Define metamorphism.
- i) Name any two rocks showing granulose structure.
- j) What are 'idioblasts'?

Q2) Write short notes on (any two) :

[10]

- a) Fixed and fugitive phases of magma.
- b) Competence and capacity of transporting medium.
- c) Cataclastic metamorphism.

P.T.O.

- Q3)** Explain the following (any two) : **[10]**
- a) Expansion cracks and reaction rim microstructures.
 - b) Laterite and Bauxite.
 - c) Regional metamorphism of basic igneous rocks.

- Q4)** Describe the crystallisation of a bi-component magma with the help of 'eutectic crystallisation'. **[10]**

OR

Define primary sedimentary structures. Explain the origin & environmental significance of ripple marks and mudcracks.



Total No. of Questions : 4]

[Total No. of Pages : 2

P168

[3617] - 213

S.Y. B.Sc.

GEOLOGY - II

GL - 222 : Palaeontology & Stratigraphy

(Paper - II) (Sem. - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following questions :

[10]

- a) Give two common body forms of anthozoans.
- b) Name two types of suture lines in ammonoids.
- c) Name any two types of facial sutures in Trilobites.
- d) Define Petrification.
- e) Name two principal types of sampling methods.
- f) Define procaryotic micro-organisms.
- g) Define Geochronologic unit.
- h) Name two types of chemostratigraphy methods.
- i) Define 'Lithostrome'.
- j) What are 'marker beds'?

Q2) Write short notes on (any two) :

[10]

- a) Characteristics & distribution of vertebraria.
- b) Systematic position and palaeoecological significance of foraminifers.
- c) Geological & geographical distribution of corals.

P.T.O.

- Q3)** Explain the following (any two) : **[10]**
- a) Cycles in vertical succession.
 - b) Magnetostratigraphy.
 - c) Lithostratigraphic units.

- Q4)** Define unconformity. Explain the environmental classification of unconformities. **[10]**

OR

Define microfossils. Explain the uses of microfossils.



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[3617] - 216

S.Y. B.Sc.

GEOGRAPHY - I

Gg - 221 : Agricultural Regions and Issues

(Paper - I) (Sem. - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.***
- 2) Figures to the right indicate full marks.***
- 3) Draw neat diagrams and sketches wherever necessary.***
- 4) Use of map stencil is allowed.***

Q1) Answer the following questions in two or three sentences each : **[10]**

- a) Give Weaver's formula for crop combination.
- b) What is the locational rent?
- c) Give full form of HYV.
- d) What is organic farming?
- e) Name any two wool-bearing sheep breeds.
- f) Give any two advantages of apiculture.
- g) Name any two biofertilizers.
- h) Name any two fruit processing methods.
- i) Define biotechnology.
- j) Name any two agro-climatic regions in India.

Q2) Write short notes on (any two) : **[10]**

- a) Voh Thunen's concentric zones of land-use.
- b) Polyhouse.
- c) Advantages of vermiculture.

P.T.O.

Q3) Answer the following questions (any two) : **[10]**

- a) What are the economic problems of Indian agriculture?
- b) What are the important features of nursery?
- c) What are the causes of fruit and vegetable spoilage?

Q4) Describe any two major allied occupations in agriculture. **[10]**

OR

What are the problems of and solutions for marketing of non-perishable agro-products?



Total No. of Questions : 4]

[Total No. of Pages : 2

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S.Y. B.Sc.

GEOGRAPHY - II

**Gg - 222 : Zoogeography
(Sem.- II) (Paper - II)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of map stencil is allowed.*

Q1) Answer the following questions in two or three sentences each : **[10]**

- a) Define Zoogeography.
- b) Define the term mutation.
- c) What do you mean by camouflaging?
- d) Give two examples of unique mammals in Australian zoogeographical region.
- e) Which continents are included in Holarctic region?
- f) List the causes of animal migration.
- g) Write two names of the fresh water fish species in India.
- h) What do you mean by dispersal?
- i) Write two names of tiger national parks in India.
- j) Write any two uses of animals.

Q2) Attempt any two of the following : **[10]**

- a) Nature of Zoogeography.
- b) Nearctic Zoogeographical regions.
- c) Dispersal of fishes.

Q3) Attempt any two of the following : **[10]**

- a) Explain the Darwin's Theory of Evolution.
- b) Explain the terrain as a barrier to dispersal of animals.
- c) Explain the need for animal conservation.

P.T.O.

Q4) Describe the major fishing grounds of the world.

OR

Explain the taxonomic classification of animals in detail.

[10]



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[3617]- 218

S.Y. B.Sc.

MICROBIOLOGY - I

MB - 221 : Growth Physiology and Systematics of Bacteria - II

(Sem.- II) (Paper - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer in one or two lines : (All questions are compulsory) : **[10]**

- a) Define substrate level phosphorylation.
- b) What is anabolism?
- c) Name any two amylase producing organisms.
- d) Write any two examples of heterofermentative lactic acid bacteria.
- e) Write the formula for % similarity.
- f) Which medium is used for detection of sugar fermentation.
- g) Write any two names of terminal electron acceptors in anaerobic respiration.
- h) Which complex drives protons back in the matrix, in chemiosmotic theory of ATP formation.
- i) What is T_m .
- j) Write any one chemical reaction catalysed by enzyme transketolase.

Q2) Attempt any two of the following : **[10]**

- a) Diagrammatically illustrate the amphibolic nature of TCA cycle.
- b) Explain the principles of Indol and M.R.test.
- c) What is numerical taxonomy? How it is used in classification of bacteria.

Q3) Attempt any two of the following : **[10]**

- a) Illustrate diagrammatically the interconnectivity of carbohydrates, proteins, lipids and nucleic acids path ways.
- b) Explain principle and methodology of "Gelatinase detection test".
- c) Describe pentose phosphoketolase pathway with chemical structures.

P.T.O.

Q4) Attempt any one of the following : **[10]**

- a) Describe with structures the reactions involved in EMP path way. Add a note on net ATP gain.
- b) Enlist the genetic methods used in taxonomy. Explain in detail DNA hybridization.



Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617]- 219

S.Y. B.Sc.

MICROBIOLOGY - II

MB - 222 : Bacterial Genetics and Applied Microbiology - II

(Sem.- II) (Paper - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer in one or two lines : **[10]**

- a) Enlist physicochemical parameters used in waste water analysis.
- b) Name techniques of air sanitation.
- c) Incubation temperature used in Eijkman's test is ——— °C.
- d) Enlist different methods of secondary treatment of effluent.
- e) Name factors affecting absorbance of sample.
- f) Define demineralised water.
- g) Name media used for confirmed test.
- h) Define C.O.D.
- i) ——— and ——— are commonly used indicator organisms of fecal pollution.
- j) Write WHO standards of potable water.

Q2) Attempt any two of the following : **[10]**

- a) Diagrammatically represent single beam spectrophotometer.
- b) Explain methods to control air flora in pharmaceutical industries.
- c) Describe fish bioassay.

Q3) Attempt any two of the following : **[10]**

- a) Comment on primary treatment of effluent.
- b) Explain the principle and working of pH meter.
- c) Write a note on impingement in liquid.

P.T.O.

Q4) Attempt any one of the following : **[10]**

- a) Enlist air borne infections and explain any two with respect to disease, causative agent, symptoms and mode of transmission.
- b) Enlist industrial water pollutants and describe their effect on ecology and health in detail.



Total No. of Questions : 4]

[Total No. of Pages : 1

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S.Y. B.Sc.

PSYCHOLOGY - I

**Experimental Psychology
(Sem.- II) (Paper - I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) Attempt all questions.*
- 2) Draw the figures and diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer in two or four sentences : **[16]**

- a) What is creativity?
- b) Define motivation.
- c) What is stimulus scale?
- d) What is decision making?
- e) What is a psychological test?
- f) What is verbal thinking?
- g) Define intelligence.
- h) What is personality?

Q2) Attempt any two of the following in eight or ten sentences : **[8]**

- a) Discuss the stages of creative thinking.
- b) Explain the types of judgement.
- c) Explain in brief the characteristics of a good psychological test.

Q3) Write short notes on any two of the following : **[8]**

- a) Decision making.
- b) Reliability and validity of judgement.
- c) Measurement of intelligence.

Q4) Explain in detail the biological and social motives.

OR

What is judgement? Explain some general principles of judgement. **[8]**



Total No. of Questions : 4]

[Total No. of Pages : 1

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S.Y. B.Sc.

PSYCHOLOGY - II

Psychology of Organizational Behaviour

(Sem.- II) (Paper - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) Attempt all questions.*
- 2) Draw the figures and diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer in two or four sentences : **[16]**

- a) Define stress.
- b) What is conflict?
- c) Define leader.
- d) What is Organizational Change?
- e) What is job rotation?
- f) Define morale.
- g) What is change process?
- h) What is collective bargaining?

Q2) Attempt any two of the following in eight to ten sentences : **[8]**

- a) Explain the micro level forces influencing organizational change.
- b) Explain the types of interpersonal conflicts.
- c) Briefly explain the various strategies of change.

Q3) Write short notes on any two of the following : **[8]**

- a) Consequences of inter group conflict.
- b) Bureaucracy.
- c) MBO.

Q4) Discuss in detail the various types of leadership.

OR

Explain in detail the various determinents of morale. **[8]**



Total No. of Questions : 4]

[Total No. of Pages : 2

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S.Y. B.Sc.

ELECTRONIC SCIENCE - I

EL - 221 : Circuit Design : Principles and Applications - II
(Paper - I) (Sem.- II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) All sub questions are compulsory :

- a) What is an oscillator circuit? State its need. [1]
- b) Why positive feedback is used in comparators? [1]
- c) What is the purpose of series pass transistor in linear series regulators?[1]
- d) State advantages of ADC. [1]
- e) In a wein bridge oscillator, $R_1 = R_2 = 100 \text{ k}\Omega$ and $C_1 = C_2 = 250 \text{ pF}$. Determine the frequency of oscillation. [2]
- f) Calculate the resolution of 4 bit DAC in volts with supply voltage equal to 10V. Also calculate percentage resolution for 8 bit DAC. [2]
- g) Output of an astable multivibrator is a square wave. Comment. [2]
- h) Zener diode is used as a reference voltage element in designing of power supply comment. [2]

Q2) Attempt any two of the following :

- a) State and explain Barkhausen criterion to obtain sustained oscillations. [4]
- b) Explain, with circuit diagram, the working of bistable multivibrator.[4]
- c) Draw circuit diagram of positive voltage regulator using IC723. Explain its working. [4]

P.T.O.

Q3) Attempt any two of the following :

- a) What is CVCC power supply? Draw its functional block diagram. Explain its working. [4]
- b) Explain the working of simultaneous analog to digital converter. [4]
- c) Draw circuit diagram of a comparators using OP-AMP IC 741. Explain its working. [4]

- Q4)**
- a) Draw circuit diagram of negative voltage regulator using IC 723. Explain error amplifier in negative voltage regulator obtain design equation for it. [6]
 - b) Draw circuit diagram for binary weighted DAC. Explain its working. Obtain the formula for equivalent analog output voltage. [6]

OR

- a) Draw circuit diagram of phase shift oscillator. Calculate the value of the resistance in feedback network for phase shift oscillator with 1kHz frequency. The capacitor has the value of $0.1\mu\text{F}$. Also determine the value of feedback resistor R_F . [4]
- b) Calculate the duty cycle and frequency of astable multivibrator using IC 555. Given : $R_A = 2.2\text{k}\Omega$, $R_B = 4.7\text{k}\Omega$ and $C = 0.1\mu\text{F}$. [4]
- c) Design a variable voltage regulator using LM 317 for $V_o = 5$ to 15V and $I_L = 1.0\text{A}$ with current set resistor $R_1 = 240\Omega$. [4]



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S.Y. B.Sc.

ENVIRONMENTAL SCIENCE - II

**Effect of Changed Environment on Man and Management
of Environment**

(Paper - II) (Sem. - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following in 1/2 lines each :

[10]

- a) Name any 2 protected areas under Project Tiger.
- b) What are secondary pollutants?
- c) Define COD.
- d) State any 2 climatological factors in connection with air pollution.
- e) Name any 2 NGO's in Environment Education.
- f) Write examples of ex-situ conservation.
- g) Define sustainable development.
- h) Name any 2 sulphur based pollutants.
- i) State the difference between PM 10 and PM 2.
- j) Name any 2 impacts of lead pollution.

Q2) Write notes on any two of the following :

[10]

- a) Green Revolution.
- b) Primary treatment of sewage.
- c) Conservation of minerals.

P.T.O.

Q3) Answer any two of the following : **[10]**

- a) Discuss the need of social awareness in environmental management.
- b) What are sources and consequences of groundwater pollution?
- c) Mention the role of government in environmental education. and discuss its effectiveness.

Q4) Answer any one of the following : **[10]**

- a) What are standards? Define the water standards prescribed for potable, industrial and irrigation.
- b) What are protected areas? Discuss their significance in the protection of wildlife with reference to India.



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S.Y. B.Sc.

OPTIONAL ENGLISH

Text : Indian Prose for Effective Communication by

M.Nagarajan and Others

(Sem.- II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) a) Choose the right words from the list given below and fill in the blanks.
(Any Four) : **[4]**

[passable, further, rites, penetrate, conscience. aspiration]

- i) Orthodox people believe in ----- and rituals.
- ii) Crook politicians have ----- for wealth and fame.
- iii) Laser beams can ----- through bones.
- iv) One should act according to one's -----.
- v) The snow is so deep that the roads are no longer -----.
- vi) In view of student unrest, all colleges in the state are closed until
---orders.

b) Match the words in column 'A' with their meanings given in column 'B'.
[3]

- | ‘A’ | ‘B’ |
|----------------|-----------------------------|
| i) pause | i) division |
| ii) detriment | ii) delayed |
| iii) curiosity | iii) a short stop |
| iv) abstinence | iv) harm |
| v) bifurcation | v) refraining from pleasure |
| vi) belated | vi) desine to learn |

P.T.O.

- c) Arrange the following sentence into a coherent paragraph. [3]
- i) M.S. made 'Raghupati Raghav Raja Ram' the nation's favourite hymn.
 - ii) Gandhiji was very fond of her singing.
 - iii) Gandhiji liked her rendering of 'Vaishnav Jana to'.
 - iv) M.S. considered her associations with Gandhiji a great fulfilment.
 - v) When M.S. sang 'Vaishnav jana to', it brought tears from the eyes of everyone.
 - vi) M.S. sang at the public prayer meetings held by Gandhiji.

- Q2) a) Write a letter to your friend congratulating him on his success in the I.A.S. examination. [5]

OR

Make a precis of the following passage and give a suitable title to it. (Rough work will be given credit)

India is a vast country with a great measure of regional diversity in terms of language, literature, culture and local customs. At the same time, from fairly early times, a sense of oneness has characterised the Indian people. Thus it presents a typical example of 'unity in diversity'. Even the British were able to grasp this characteristic Indian reality. Hence is both the Government of India Act (1919) and the Government of India Act (1935) - especially the latter - they provided for a measure of power distribution between the centre and the provincial government. However, the basic colonial objectives of British rule and such provision as the Governor General's 'individual' and 'discretionary' powers brought to naught the professed design of provincial autonomy or federalism. Indeed, the essence of federal government, as noted by eminent authority-Professor K.C. Wheare (of Oxford), is that under it the two types of Governments - the central and the regional - should be "Independent in their spheres" and "co-ordinate" in their mutual relationship. None of them should be able to dictate to the other in the latter's sphere or exercise control over it either directly or otherwise. It is broadly this type of policy that the constitution of the United states envisages and which is widely regarded as the most typical example of contemporary federal government. Hence the fundamental point is to see or examine whether the two types of governments in India - the Union or Central Government, on the other hand, and the Government of the States, on the other - are co-ordinate

and independent of each other in their respective spheres, constitutionally and functionally, and in the historical perspective.

(Employment News, Vol, Xviii, No. 43).

- b) Write a report on the 'Annual social Gathering' of your college. [5]

OR

You are invited to deliver a lecture on 'Alienation from parents is the basic problem that youth create for themselves and to the society: Write down main points and sub-points of the lecture in the form of notes.

Q3) Answer the following questions in about 30 words (Any Five) : [10]

- a) Why does Mr. Tarkunde say that India had glorious past than any other country?
- b) What was S. Ray's experience on the second day of shooting.
- c) What are Dr. Ambedkar's views on political democracy?
- d) Why does Swami Vivekananda say physical help is least important?
- e) Explain the remark, 'Ashram was not in Pondicherry but Pondicherry was in Ashram!'
- f) What were the things, which influenced Mother Teresa?
- g) What is the significance of the Directive Principles of the constitution of India?

Q4) Answer the following questions in about 150 words (Any Two) : [10]

- a) What are Nehru's suggestions to Indira about History?
- b) What are Dr. Ambedkar's views on Political and social democracy?
- c) What are Sri Aurobindo's views about philosophy?



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[3617]-232

S.Y. B.Sc. (Sem. - II)

मराठी (Marathi)

व्यावहारिक मराठी

(नवा अभ्यासक्रम)

वेळ : 2 तास]

[एकूण गुण : 40

सूचना :- 1) सर्व प्रश्न अनिवार्य आहेत.

2) उजवीकडील अंक प्रश्नांचे पूर्ण गुण दर्शवितात.

प्रश्न 1) अ) पुढील उताऱ्याचे मराठीत भाषांतर करा.

[8]

A wide range of plants have been under cultivation for various purposes. There are more than 6000 such crop species, but only a few are used as staple crops. In spite of major contribution of these crops, contribution of some minor species cannot be ignored. Safflower is one such oldest crop. It continued to remain a minor crop grown on small plots for growers personal use. In Hindi and Marathi it is known as Kusum and Kardai respectively.

It is native to the old world and it occurs naturally in Mediterranean Region, North Eastern Africa and South Western Asia to India. It is cultivated in India mainly for oil (obtained from seeds) and reddish-orange dye (obtained from flowers) the seeds are also used as birdseed-from the ancient times, safflower flowers had been used in Preparations of Ayurvedic Medicines in India, Europe, Japan and China. Its Medicinal uses in China became more widely known all over the world, because it is grown there in large scale exclusively for flowers (which are used to cure many diseases and as tonic tea). This led to revival of this ancient crop in last few decades. Based on the geographical distribution, anatomical and biosystematic information, a new classification system has been proposed.

P.T.O.

ब) पुढील उताऱ्याचा शीर्षकासह एक तृतीयांश सारांश लिहा. [7]

आपली बुद्धीमत्ता, आपले गुण व मेहनत पणाला लावून यशाकडे वाटचाल करणे हेच खरे प्रत्येक व्यक्तीचे आयुष्यातील ध्येय असले पाहिजे. एक गोष्ट विसरता कामा नये की दुसऱ्याला हरविण्यासाठी विजयाकडे वाटचाल करणारे महाभाग खऱ्या अर्थाने विजयी होत नाहीत. ज्या क्षेत्रात विजय मिळविण्यासाठी धडपड चालू असते, त्या क्षेत्रात देदिप्यमान कामगिरी करणे यातच खरा विजय असतो. सगळी आधीची 'रेकॉर्ड' नुसती तोडायची नाहीत तर भविष्यातील उमेदवारांसाठी नवी क्षितिजे, नव्या आकांक्षा निर्माण करायच्या हेच ध्येय असले पाहिजे. 'माझी प्रगती किती झाली आहे ? मी किती प्रमाणात यश मिळविले आहे आणि अजूनही मिळवू शकेन ?' याची उत्तरे शोधणाराच खऱ्या अर्थाने आयुष्यात विजयी वाटचाल करीत असतो. मानव हा समाजप्रिय प्राणी आहे. त्यामुळे मानवाचे प्रत्येक यश अपयशाचे कृत्य समाजाच्या मान्यतेचा शिक्का जोपर्यंत त्या व्यक्तीच्या कपाळी बसत नाही, तोपर्यंत खऱ्या अर्थाने ती व्यक्ती विजयी म्हणताच येणार नाही. आपल्या पूर्वजांची उदाहरणे घेऊ. चाणक्याची राजनीती काय किंवा कोपर्निकसचे अवकाशातील ग्रहताऱ्यांचे सिद्धांत काय, एकदा ते समाजग्राह्य झाल्यावर जगात जोपर्यंत मानव हयात आहे. तोपर्यंत तेही हयातच राहतील. स्थळ, काळ यांची बंधनेही तोडून !

(शब्द संख्या - १५८)

प्रश्न 2) पुढीलपैकी कोणत्याही दोन प्रश्नांची उत्तरे लिहा. [15]

- अ) 'दहशतवाद एक समस्या' या विषयावर वर्तमानपत्रासाठी 300 शब्दांत लेख लिहा.
- ब) 'वैज्ञानिक दृष्टिकोन — काळाची गरज' या विषयावर आकाशवाणीसाठी 300 शब्दांचे भाषण तयार करा.
- क) 'जल प्रदूषण' या विषयावर दूरदर्शनसाठी लघुपट तयार करावयाचा आहे. संहिता लेखन करा. लघुपट कालावधी - 5 मिनिटे.

प्रश्न 3) खालील इंग्रजी शब्दांसाठी मराठीतील पारिभाषिक शब्द लिहा. [10]

- | | |
|--------------|--------------------|
| 1. Artiste | 2. Anatomy |
| 3. Toxicosis | 4. Green belt |
| 5. Cookery | 6. Factor analysis |
| 7. Total | 8. Algebra |
| 9. Computer | 10. Enzyme |

□□□□

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S.Y. B.Sc. (Sem. - II)

हिंदी

समय : 2 घंटे]

[पूर्णांक : 40

पाठ्यपुस्तकें : i) मेरी श्रेष्ठ व्यंग्य रचनाएँ :

लेखक - हरिशंकर परसाई ।

ii) आधुनिक काव्य संग्रह :

संपादक - डॉ. विजयेन्द्र स्नातक ।

सूचनाएँ : i) सभी प्रश्न अनिवार्य हैं।

ii) दाहिनी ओर लिखे अंक प्रश्न के पूर्णांक हैं ।

प्रश्न 1) अ) निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर लिखिए :

[8]

क) 'अकाल उत्सव' पाठ में लेखक किस तरह के सपने देखता है ?

ख) सफेद बाल के मौसम में बड़े समझौते होते हैं, ऐसा लेखक क्यों कहते हैं ?

ग) लेखक ने ऐसा क्यों कहा है कि शीत और गर्मी में फँसा है देश का वसंत !

आ) निम्नलिखित अवतरण की ससंदर्भ व्याख्या कीजिए :

[5]

घ) "बिना किए जब माथा तन गया, तो करने का कष्ट क्यों करें ? अकर्म का ऐसा बड़ा अनुष्ठान और कहीं नहीं हुआ होगा ।"

अथवा

घ) "क्रांति में साथ देने से सब गोदामें बच गयी । अब पुलिस और लड़के लड़ रहे हैं । अपने मजे में बैठे हैं ।"

प्रश्न 2) अ) निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर लिखिए :

[8]

च) कवि दिनकर की कविता कवि से क्या चाहती है ?

छ) 'लोहे के पेड़ हरे होंगे' कविता के उद्देश्य को स्पष्ट कीजिए ।

ज) 'गुलाबी चूड़ियाँ' कविता के आशय को स्पष्ट कीजिए ।

आ) निम्नलिखित अवतरण की ससंदर्भ व्याख्या कीजिए :

[5]

झ) “वे हुलसित हैं

अपनी ही फसलों में डूब गये हैं,

तुम हुलसित हो

चितकबरी चाँदनियों में खोये हो।”

अथवा

झ) “धरती के भाग हरे होंगे, भारती अमृत बरसायेगी,

दिन की कराल दाहकता पर चाँदनी सुशीतल छायेगी।

ज्वालामुखियों के कण्ठों में कलकण्ठी का आसन होगा।

जलदों से लदा गगन होगा, फूलों से भरा भुवन होगा।”

प्रश्न 3) अ) निम्नलिखित अंग्रेजी संक्षिप्तियों में से किन्हीं दस के हिंदी पूर्ण पर्याय लिखिए : [10]

1) C.I.D.

2) C.B.

3) C.T.B.T.

4) D.C.C.

5) D.I.R.

6) F.E.R.A.

7) I.B.A.

8) I.M.F.

9) M.P.S.C.

10) N.A.B.A.R.D.

11) U.N.E.S.C.O.

12) S.A.A.R.C.

आ) निम्नलिखित अनुच्छेद का सारांश एक तिहाई में लिखते हुए उसे एक उचित शीर्षक दीजिए : [4]

बेंजामिन फ्रैंकलिन एक वैज्ञानिक था, बादलों में कड़कती बिजली देखकर विद्युत निर्माण की बात उसके मन में कौंध गई। उसने एक प्रयोग किया था, उसने रेश्मी रूमाल की पतंग तैयार की। उस पतंग को उड़ाकर उसके दूसरे छोर पर उसने चाबी बांधी। वह छोर उसने अपने हाथ में पकड़े रखा, आसमान में काली घटाएँ छा गई। और बेंजामिन की पतंग बादलों तक पहुँची। इतने में बिजली कड़की उसने चाबी को जैसे ही स्पर्श किया उसे जोर का झटका लगा। बादलों में कड़कती बिजली उसकी चाबी तक पहुँची थी। बेंजामिन के इस खोज का उपयोग इमारतों को हुआ। बड़ी इमारतों के सबसे ऊँचे भाग पर विद्युतवाहक लगाए गए। वे बादलों की बिजली पकड़ने लगे और बिजली सीधे जमीन में समा गई। विद्युत वाहक की खोज ने बेंजामिन फ्रैंकलिन को महान वैज्ञानिक बनाया।

□□□□

Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617]-234

S.Y. B.Sc. (Semester - II)

SANSKRIT

Suravāṇī (सुरवाणी)

Time : 2 Hours]

[Max. Marks : 40

Q1) Write short answers in 2-4 lines of the following questions. [16]

पुढील प्रश्नांची 2-4 ओळीत उत्तरे लिहा.

- i) Which are the functions of Vāyu?
वायुची कार्ये कोणती ?
- ii) How Prajapati has described the self in the dream state?
प्रजापतीने स्वप्नावस्थेतील आत्म्याचे वर्णन कसे केले आहे ?
- iii) Point out the measurements of 'अन्नालय'.
अन्नालयाची परिमाणे सांगा.
- iv) What are the qualifications of an attendant?
परिचारकाचे पात्रतादर्शक गुण कोणते ?
- v) What did Śaryāta do when he knew the fact?
शर्याताला वस्तुस्थिती कळल्यावर त्याने काय केले ?
- vi) Which things happened when the eagle caught जीमूतवाहन ?
गरुडाने जीमूतवाहनाला पकडताच कोणत्या गोष्टी घडल्या ?
- vii) What are the three मल's? What are their functions?
तीन मल कोणते ? त्यांची कार्ये कोणती ?
- viii) Describe the three types of Chalani.
तीन प्रकारच्या चाळण्यांचे वर्णन करा.

P.T.O.

Q2) Write short notes on any two of the following : (8-10 lines) **[8]**

पुढीलपैकी कोणत्याही दोहोंवर 8-10 ओळीत संक्षिप्त टीपा लिहा.

- i) पित्तदोष
- ii) धान्यालय — सुखालय
- iii) An appointment of Vaidya's in Rasashala.
रसशाळेतील विविध वैद्यांची नेमणूक.

Q3) Write short notes on any two of the following : (8-10 lines) **[8]**

पुढीलपैकी कोणत्याही दोहोंवर 8-10 ओळीत संक्षिप्त टीपा लिहा.

- i) Character of जीमूतवाहन.
जीमूतवाहनाचे व्यक्तिचित्रण.
- ii) Character sketch of सुकन्या.
सुकन्येचे व्यक्तिचित्रण.
- iii) Mother of शङ्खचूड.
शङ्खचूडमाता.

Q4) Answer any one of the following questions : (16-20 lines) **[8]**

पुढीलपैकी कोणत्याही एका प्रश्नाचे उत्तर 16-20 ओळींमध्ये लिहा.

- i) Which Philosophy was explained by प्रजापती in इन्द्रविरोचन कथा ?
इन्द्रविरोचनकथेमध्ये प्रजापतीने कोणते तत्त्वज्ञान स्पष्ट केले ?
- ii) Description of Kapha and Vatadosa in त्रिदोषविज्ञानम्.
त्रिदोषविज्ञानम् पाठात सांगितलेल्या कफ आणि वातदोषांचे वर्णन करा.

□□□□

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[3617] - 235

S.Y. B.Sc.

INDUSTRIAL CHEMISTRY (P - I)

VOC - 221 : Unit Processes in Organic Industries

(Paper - I) (Sem. - II) (Vocational Course) (25612)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Give balanced equations with conditions for the following reactions / synthesis: **[16]**

- a) Acetic acid \rightarrow Iodo acetic acid.
- b) Anthracene to anthroquinone.
- c) Aniline \rightarrow Chloro benzene.
- d) Commercial manufacture of acetaldehyde.
- e) Acetic acid to ethyl alcohol.
- f) Nitro benzene to p-amino phenol.
- g) Vinyl ester from acetylene.
- h) Chloroacetic acid \rightarrow Glycine.

Q2) Attempt any two of the following :- **[8]**

- a) Describe the batch process of nitration of benzene.
- b) Name the hydrogenation catalysts and describe any two of them.
- c) Describe the manufacture of benzoic acid from toluene.

P.T.O.

Q3) Write short notes on any two of the following :- **[8]**

- a) Manufacture of vinyl acetate.
- b) Friedel Crafts reaction.
- c) Preparation of Naphthalene-2-sulphonic acid.

Q4) Describe the manufacture of Chloral from ethyl alcohol. **[8]**

OR

Describe briefly the hydrogenation of oils.



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[3617] - 236

S.Y. B.Sc.

BIOTECHNOLOGY

VOC - Biotech - 221 : Recombinant DNA Technology

(Vocational) (Paper - I) (Sem. - II) (130221)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

Q1) Answer each of the following in 1 – 2 lines :

[10]

- a) What are phagemids?
- b) What are exonucleases and endonucleases?
- c) Define gene cloning.
- d) Give the role of T-DNA in RDT.
- e) Name any two animal viruses used as vectors.
- f) What is C-DNA?
- g) Name the heat stable enzyme used in PCR.
- h) What is proteomics?
- i) Give the role of ethanol in DNA isolation.
- j) Enlist any two gene delivery systems.

Q2) Write short notes on any two of the following in 8 – 10 lines each :

[10]

- a) Plasmids.
- b) Restriction enzymes.
- c) Plant viruses.

P.T.O.

Q3) Attempt any two of the following in 8 – 10 lines each : **[10]**

- a) Describe the process of isolation of plant DNA.
- b) Give applications of cloning in studying gene expression.
- c) Explain safety measures for RDT work.

Q4) What are recombinant vaccines? Explain how they differ from classical vaccines and add a note on their applications. **[10]**

OR

Describe steps involved in PCR technique. Add a note on its applications.



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[3617] - 238

S.Y. B.Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE (P - I)

**VOC - EEM - 221 : Audio, Video & Office Equipments - B
(Sem.- II) (Paper - I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following :

- a) Attempt all **[4]**
 - i) What is the need of Cache memory in PC?
 - ii) State the applications of touch screen.
 - iii) What is the resolution of VGA monitor?
 - iv) State the type of lens used in OHP?
- b) Attempt all **[4]**
 - i) State the principle of operation of a rolling display.
 - ii) What are the common faults in Inkjet printer?
- c) Attempt all **[4]**
 - i) Discuss the principle of operation of a Barcode reader.
 - ii) State the applications of CCD array.

Q2) Answer any two of the following :

- a) What is DLP? State the advantages of DLP over LCD projectors. **[4]**
- b) Compare the flat panel display technology with traditional CRT technology. **[4]**
- c) Explain the construction of OHP. **[4]**

P.T.O.

Q3) Answer any two of the following :

- a) Write a short note on EPABX. [4]
- b) Explain the working of Light Pen. State its applications. [4]
- c) Explain the working of Xerox machine. [4]

Q4) Answer the following :

- a) Draw a neat diagram of a FAX machine. Explain the necessary steps of converting text into binary information. [6]
- b) Explain the functions of motherboard with the help of neat functional diagram. [6]

OR

- a) State the principle of laser printer. Draw a neat diagram with proper labelling. [6]
- b) Write a short note on standard data buses used on a motherboard. [6]



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[3617]-241

**S.Y. B.Sc. (Vocational)
SEED TECHNOLOGY - I
Vegetable Seed Production
(Paper - III) (Semester - II)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following :

[10 × 1 = 10]

- a) Give any two objectives of vegetable breeding.
- b) What is asexual reproduction?
- c) Define self incompatibility.
- d) What is genetic male sterility?
- e) Give any two equipments required for hybridization techniques in vegetables.
- f) What are double cross hybrids?
- g) Give any two examples of root vegetables.
- h) Define Planting ratio.
- i) Enlist seed extraction methods.
- j) Define Plant Protection.

Q2) Attempt any two of the following :

[2 × 5 = 10]

- a) Give the cultural practices for seed production of palak.
- b) Explain the formation of male gamete in vegetable crops.
- c) Give an brief account of apomixis.

P.T.O.

Q3) Write notes on (any two) :

[2 × 5 = 10]

- a) Cytoplasmic male sterility.
- b) Back cross hybrids.
- c) Emasculation and use of gametocides.

Q4) Explain methods and achievements of pureline and clonal selection. **[10]**

OR

Describe any one methods of population improvement in vegetable crops?



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[3617]-242

**S.Y. B.Sc. (Vocational Course)
INDUSTRIAL CHEMISTRY (P - II)
Voc - 222 : Industrial Pollution
(Paper - II) (Semester - II) (25622)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following questions : **[16]**

- a) Define Lithosphere. How is it useful to humans?
- b) What is meant by stone leprosy?
- c) What is meant by soil profile?
- d) Define sewage and name some pollutants present in it.
- e) How is hardness of water removed?
- f) Why there is inversion of temperature in stratosphere?
- g) Define noise pollution. How is it measured?
- h) What is salinity of water?

Q2) Attempt any two of the following : **[8]**

- a) Describe a method to estimate any two of the following :
 - i) BOD
 - ii) As
 - iii) Hg
- b) Name the sources of nitrogen oxides in air and give its ill effects on humans.
- c) Distinguish between coagulation and peptization.

P.T.O.

Q3) Write short notes on any two of the following : **[8]**

- a) Nitrogen cycle.
- b) Photo chemical smog.
- c) Types of chlorination.

Q4) What is meant by Green house effect? Name the sources, its effects and measures to control it. **[8]**

OR

Describe the treatment of municipal water for drinking purposes.



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[3617]-243

S.Y. B.Sc. (Vocational)

BIOTECHNOLOGY

Voc - Biotech-222: Immunology & Animal Cell Culture

(Paper - II) (Semester - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*

Q1) Answer each of the following in 1-2 lines.

[10]

- a) Define : Organ culture.
- b) What are selectable markers.
- c) Give the role of Glutamine in ATC medium.
- d) Enlist two environmental factors affecting culturing of cells.
- e) What is allograft?
- f) Write any two examples of vaccines.
- g) Give the role of NK cells in immunity.
- h) What are Cytokines?
- i) Write any two applications of ELISA technique.
- j) What are primary lymphoid organs?

Q2) Write short notes on any two of the following (8-10 lines)

[10]

- a) Immunodiffusion technique.
- b) Antibody structure.
- c) Importance of serum in medium.

P.T.O.

Q3) Attempt any two of the following in 8-10 lines each. **[10]**

- a) What is cell fusion? Write its importance in production of monoclonal antibodies.
- b) What are transformed cells? Discuss the properties of transformed cells.
- c) Describe in detail the process of phagocytosis.

Q4) What is cell line? Describe in detail the routine maintenance of cell line. **[10]**

OR

Describe in detail: Cell mediated immunity.



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[3617]-245

S.Y. B.Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE (EEM) (P - II)

VOC-EEM-222: Maintenance Concepts and Repair - II-B

(Paper - II) (Semester - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following.

- a) Why installation should preferably be done by supplier or manufacturer? [1]
- b) What is MCB? [1]
- c) State the old and new colour conventions used while connecting three pin plugs. [1]
- d) Explain the spillage damage of keyboard. How to avoid it? [1]
- e) 'Computer should be protected from virus' - Comment. [2]
- f) 'Preventive maintenance of computer involves both hardware and software maintenance' - Comment. [2]
- g) Why excess feeder of a TV antenna should be properly coiled and affixed to the wall for safety? [2]
- h) State the essential qualities of a typical power supply system for electronic equipment. [2]

Q2) Answer any two of the following : [2 × 4 = 8]

- a) How does the selection procedure for the site for installation of TV antenna is done. Explain its installation process.
- b) Give general requirements of physical and electric power conditions for electronic equipments.
- c) Explain in brief the safety measures to be taken to prevent mechanical and fire hazards.

P.T.O.

Q3) Attempt any two of the following : **[2 × 4 = 8]**

- a) Write a short note on preventive maintenance of rechargeable battery.
- b) Explain the precautions to be taken while handling computer system.
- c) What are the advantages & disadvantages of Ni-Cd cells over lead-acid cells.

Q4) Attempt the following : **[2 × 6 = 12]**

- a) Discuss installation plan for a computer server.
- b) Describe the preventive maintenance schedule for a communication transceiver.

OR

- a) Explain the purpose and methods of earthing. Compare the plate and pipe earthing methods.
- b) Draw a neat labelled schematics of lead-acid battery. What are the typical faults with a lead-acid battery? Which parts need attention to avoid failure?



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[3617]-246

S.Y. B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY (P - II)

VOC-IND-MIC-222 : Quality Assurance in Industrial Products.

(Theory Paper - II) (Semester - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Use of scientific calculators is allowed.*

Q1) Answer each sub-question in one or two lines; Fill in the blanks; State whether the statement is true or false. **[10]**

- a) Define “Quality Assurance”.
- b) Define “Pyrogen”.
- c) Define “Assays”.
- d) Give the full form of ‘BIS’.
- e) State whether the following statement is true or false.
“All injectables are both pyrogen-free and sterile”.
- f) State whether the following statement is True or False.
“The inherent sensitivity of the test organism in microbial assay affects the diffusion”.
- g) State whether the following statement is True or False.
“All Gram positive bacteria are not pyrogenic pathogens”.
- h) Fill in the blank :
A heat sterilized product may not be pyrogen-free because _____.
- i) State the difference between ‘Diluent 1’ and ‘Diluent 2’ used for dilution of a substance to be tested for sterility.
- j) State the name and the role of the dye used in Fluid Thioglycollate medium.

P.T.O.

Q2) Attempt any two of the following : **[10]**

- a) Explain the advantages and limitations of the LAL Test.
- b) What is the difference between the 'Ames Test' and the 'Modified Ames Test'? Explain why this modification is necessary.
- c) Justify the following statement :
"Gel diffusion assay though less sensitive is more commonly used, as compared to the turbidimetric assay, for microbiological assays of antibiotics".

Q3) Attempt any two of the following : **[10]**

- a) All quality assurance tests need to be standardized. Explain with a suitable example.
- b) State the names of two products which need to be tested for carcinogenicity. Explain the test.
- c) Allergen testing is done only for certain types of products. Name two such products, and explain the test.

Q4) Attempt any one of the following : **[10]**

- a) You are given a vial of penicillin G. The label on the vial states that it contains 1,00,000 units of penicillin. It is felt that the vial is probably mislabeled. Explain how you would verify the potency of the contents.
- b) Enlist the quality assurance tests carried out for packaged mineral water, and explain in detail any one of the tests carried out, other than pathogen load.



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[3617]-247

S.Y. B.Sc. (Vocational)

COMPUTER MAINTENANCE (P - II)

Trouble Shooting of Computers

(Paper - II) (Semester - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following :

[16]

- a) Write any two ill-effects of highpower magnetic field near PC.
- b) What will you do if the device attached to USB port is not recognized?
- c) Write two ways in which beeps can be used to identify problems.
- d) Describe two simple precautions to be taken while deciding the location of a PC.
- e) What two steps would you take before you open the system box of a PC?
- f) List different types of display adapters you know.
- g) Write the importance of UPS for a PC.
- h) What is the use of a screen saver for a display monitor?

Q2) Attempt any TWO :

[8]

- a) List different electronic equipments used for troubleshooting by hardware approach. Explain any one in detail.
- b) Write a short note on “diagnostic Softwares”.
- c) List common problems that may arise while using serial and parallel port to connect devices. Write steps to overcome them.

Q3) Attempt any TWO : **[8]**

- a) Explain in brief the preventive maintenance of UPS and Power supply of a PC.
- b) Describe the safety precautions you would take while troubleshooting and repairing a PC.
- c) In what different ways can a printer malfunction? How will you overcome them?

Q4) Attempt any ONE : **[8]**

- a) Explain the causes and suggest proper action for the following :
 - i) Hard disk failure
 - ii) Mouse failure
- b) Describe in details the routine preventive steps you would take to guard your PC from the following :
 - i) Software related hazards from internet
 - ii) Human intruder with corrupt intentions.



P197

[3617]-248

**S.Y. B.Sc. (Vocational)
SEED TECHNOLOGY (P - II)
Seed Quality Control
(Paper - IV) (Semester - II)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following :

[10]

- a) Define seed quality.
- b) What is seed legislation?
- c) Define breeders seed.
- d) Enlist any two seed certification agencies.
- e) What is isolation distance?
- f) Define tagging.
- g) What is genetic purity?
- h) Define seed certification.
- i) Give any two roles of Central Seed Certification Board.
- j) State New Seed Policy (1988).

Q2) Attempt any two of the following :

[10]

- a) Give the principles of field inspection.
- b) Give an account of importance of sampling for seed quality evaluation.
- c) Describe in brief the classes of seed.

P.T.O.

- Q3)** Write notes on (any two) : **[10]**
- a) Objectives of seed legislation.
 - b) Seed Certification Standards.
 - c) Issue of Certificates.

- Q4)** Describe in brief the technique of field inspection for seed production plots of straight varieties in cotton. **[10]**

OR

Explain in detail seed quality concepts with respect to physical purity, germination, health and genetic purity.



P517**[3617]- 201****S.Y. B.Sc.****MATHEMATICS****MT - 221 : Linear Algebra - II****(Sem. - II) (Old Course)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:**

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Answer the following questions in short :**[10]**

a) If A is square matrix of order 4 with $\det (A^{-1}) = \frac{1}{2}$ then find $\det [B (3A) B^{-1}]$.

b) Let $A = \begin{bmatrix} 2 & 7 \\ 1 & 8 \end{bmatrix}$, evaluate $\det (A)$ by cofactor expansion along the second column of A.

c) Check whether Cramer's rule can be applied to solve the system of equations.

$$x + y + z = 2$$

$$2y + z = 3$$

$$-6y - 3z = -9$$

d) Find the rank of matrix

$$A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ 0 & 5 \end{bmatrix}$$

e) Check whether the following system of equations is consistent

$$x + y + z = 5$$

$$y = 1$$

f) Find an angle between two vectors $\vec{u} = (k, 0, 0)$ and $\vec{v} = (1, 1, \sqrt{2})$ in an Euclidean inner product space \mathbb{R}^3 .

P.T.O.

- g) If \bar{u} and \bar{v} are ortho normal vectors in an inner product space V. find $\|\bar{u} - \bar{v}\|$.
- h) Define 'Orthogonal Transformation'.
- i) Express the quadratic form $x_1^2 + x_2^2 - x_3^2 - x_4^2 + 2x_1 x_2 - 10x_1 x_4 + 4x_3 x_4$ in matrix notation $X^t A X$, where A is symmetric matrix.
- j) If $A = \begin{bmatrix} 2 & 5 & 6 \\ 0 & -2 & 0 \\ 0 & 0 & 5 \end{bmatrix}$, find eigen values of A^{-1} .

Q2) Attempt any two of the following : **[10]**

- a) If A is mxn matrix, then prove that the system of linear equations $AX = B$ is consistent if and only if the rank of the augmented matrix $[A | B]$ is equal to rank of A.
- b) Find the inverse of the matrix A by using the adjoint method where

$$A = \begin{bmatrix} 2 & 0 & 3 \\ 0 & 3 & 2 \\ -2 & 0 & -4 \end{bmatrix}.$$

- c) Evaluate determinant of matrix $A = \begin{bmatrix} 2 & 5 & 5 \\ -1 & -1 & 0 \\ 2 & 4 & 3 \end{bmatrix}$ by using signed elementary products.

Q3) Attempt any two of the following : **[10]**

- a) Find eigen-space corresponding to largest eigenvalue of the matrix

$$A = \begin{bmatrix} 2 & -1 & 1 \\ 0 & 3 & -1 \\ 2 & 1 & 3 \end{bmatrix}.$$

- b) Solve the following system of linear equations by using Cramer's rule.

$$2x + 3y - z = 2$$

$$x + 2y + z = -1$$

$$2x + y - 6z = 4$$

c) If \bar{u}, \bar{v} are vectors in an inner product space V and K be any scalar, then prove that

i) $\|k\bar{u}\| = |k| \|\bar{u}\|$

ii) $\|\bar{u} + \bar{v}\| \leq \|\bar{u}\| + \|\bar{v}\|$.

Q4) Attempt any one of the following : **[10]**

a) Explain Gram-Schmidt's process for transforming a basis of an inner product space V to the orthogonal basis for V . Hence transform the basis $S = \{(1,2), (-3, 4)\}$ of euclidean inner product space \mathbb{R}^2 to the orthonormal basis set.

b) i) If a square matrix A of order n is diagonalizable, then prove that it has n linearly independent eigen vectors. **[6]**

ii) Find all eigen values of matrix $A = \begin{bmatrix} 3 & 2 & 2 \\ 1 & 4 & 1 \\ -2 & -4 & -1 \end{bmatrix}$ and hence,

write the eigen values of A^t and A^{-1} **[4]**



P518**[3617]- 202****S.Y. B.Sc.****MATHEMATICS****MT - 222 : Vector Calculus****(Old Course) (Sem.- II)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:**

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Answer the following questions :**[10]**

- a) If $\vec{a} = (t^2 - 1)\vec{j} + \cos t \vec{k}$, $\vec{b} = \sin t \vec{i} + e^t \vec{j}$, find $\lim_{t \rightarrow 0} (\vec{a} \times \vec{b})$.
- b) Find a unit tangent vector to the curve $x = t$, $y = t^2$, $z = \frac{2}{3}t^3$ at $t = 1$.
- c) Find the total differential of $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$.
- d) If a space curve is a straight line, what is the value of its curvature? Justify.
- e) Find $\nabla (f(r))$ where $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$, $r = |\vec{r}|$.
- f) Find a if $\vec{v} = (x + 3y)\vec{i} + (y - 2z)\vec{j} + (x + az)\vec{k}$ is solenoidal.
- g) The acceleration \vec{a} of a particle at any time t is given by $\vec{a} = e^t \vec{i} - 6(t + 1)\vec{j} + 3 \sin t \vec{k}$. If the velocity \vec{v} is a zero vector at $t = 0$. Find \vec{v} at time t .
- h) Evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = xy\vec{i} + yz\vec{j} + zx\vec{k}$ and C is the curve $\vec{r} = t\vec{i} + t^2\vec{j} + t^3\vec{k}$, t varies from -1 to 1 .
- i) State Gauss divergence theorem.
- j) Find the area of the ellipse $x = a \cos \theta$, $y = b \sin \theta$ using the formula for area of a simple closed curve C is given by $\frac{1}{2} \oint_C x dy - y dx$.

P.T.O.

Q2) Attempt any two of the following : **[10]**

- a) Show that a vector function $\bar{u} = \bar{u}(t)$ is of constant magnitude if and only if $\bar{u} \cdot \frac{d\bar{u}}{dt} = 0$.
- b) A particle moves along a curve $\bar{r}(t) = (t^3 - 4t)\mathbf{i} + (t^2 + 4t)\mathbf{j} + (8t^2 - 3t^3)\mathbf{k}$. Find the magnitude of the tangential and normal components of its acceleration at $t = 2$.
- c) Show that $\bar{f} = (6xy + z^3)\mathbf{i} + (3x^2 - z)\mathbf{j} + (3xz^2 - y)\mathbf{k}$ is irrotational. Find a scalar potential ϕ such that $\bar{f} = \nabla \phi$.

Q3) Attempt any two of the following : **[10]**

- a) If ϕ, \bar{u} are scalar and vector functions of x, y, z respectively then prove that $\text{div}(\phi \bar{u}) = \text{grad} \phi \cdot \bar{u} + \phi \text{div} \bar{u}$.
- b) Find the directional derivative of $\phi = xyz$ in the direction of the normal to the surface $xy(x + y) + yz^2 - 3 = 0$ at $(1, 1, 1)$.
- c) If \bar{a} is a constant vector, show that $\text{Curl}(\bar{r} \times \bar{a}) = -2\bar{a}$.

Q4) Attempt any one of the following : **[10]**

- a) Verify Green's theorem in a plane for $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is a region bounded by the parabolas $y^2 = x$ and $y = x^2$.
- b) i) Using Stoke's theorem for the function $\bar{f} = x^2\mathbf{i} + xy\mathbf{j}$, evaluate $\oint_C \bar{f} \cdot d\bar{r}$ where C is a square in the plane $z = 0$ with sides along the lines $x = 0, x = a, y = 0, y = a$.
 ii) Using Gauss divergence theorem, show that $\iiint_S (x^2\mathbf{i} + y^2\mathbf{j} + z^2\mathbf{k}) \cdot \bar{n} \, ds = 0$ where S denotes the surface of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$



P519**[3617]-203****S.Y. B.Sc. (Semester - II)****MATHEMATICS****MT - 223 and MT - 224****(Old Course)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:**

- 1) Candidates are advised to see the relevant question paper and solve the same.
- 2) In each question paper, all questions are compulsory.
- 3) Figures to the right indicate full marks.

MT - 223 : Complex Variables**Q1)** Answer the following questions :**[10]**

- a) Evaluate $\lim_{z \rightarrow 2-i\sqrt{3}} \frac{z^2 - 1}{z - 2}$.
- b) Determine whether the set $A = \{z \in \mathbb{C} \mid |z - 1 + 3i| \leq 1\}$ is a domain.
- c) Determine the points of discontinuities of the function $f(z) = \frac{z^2 + 2z + 3}{z^2 + 2z - 3}$.
- d) Show that $u(x, y) = x^2 - y^2 + x$ is a harmonic function.
- e) Is the function $f(z) = e^x (\cos y - i \sin y)$ analytic? Justify.
- f) Evaluate $e^{(1+\pi i)}$.
- g) Show that $\cosh^2 z - \sinh^2 z = 1$ for all $z \in \mathbb{C}$.
- h) $\int_C (y - x - 3x^2 i) dz$ where C is the straight line segment from $z = 0$ to $z = 1 + i$.
- i) Find the zeros of the function $f(z) = z^3 + 3z^2 - z - 3$.
- j) State Cauchy's Residue theorem.

Q2) Attempt any two of the following :**[10]**

- a) Prove that every differentiable function of a complex variable is continuous. Is the converse true? Justify.

P.T.O.

- b) If $f(z) = u + iv$ is an analytic function of z , where $u = x^3 - 3xy^2$ and $f(i) = 2$, then find $f(z)$.
- c) Find all values of i^i .

Q3) Attempt any two of the following. **[10]**

- a) Prove that the real and imaginary parts of an analytic function $f(z) = u + iv$ are harmonic function.
- b) Expand $\frac{1}{z^2 + 3z + 2}$ in the form of Laurent's series, if $|z| < 1$.
- c) Evaluate $\int_C \frac{z+6}{z^2-4} dz$
where C is the circle $|z-2| = 1$.

Q4) Attempt any one of the following : **[10]**

- a) i) If $f(z)$ is analytic within and on a closed contour C and z_0 is any point inside C , then prove that $\int_C \frac{f(z)}{z-z_0} dz = 2\pi i f(z_0)$.

- ii) Find the sum of the residues of the function $f(z) = \frac{5z-2}{z(z-1)}$

- b) Evaluate, by contour integration, $\int_{-\infty}^{\infty} \frac{\cos 3x}{x^2+4} dx$



P519**[3617]-203****S.Y. B.Sc. (Semester - II)****MATHEMATICS****MT - 223 and MT - 224****(Old Course)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:**

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

MT - 224: Differential Equations and Laplace Transform**Q1)** Solve the following questions :**[10]**

- a) Solve the equation $(D - 1)^5 y = 0$.
- b) Find the particular integral of $\frac{d^3 y}{dx^3} + 9 \frac{dy}{dx} = \cos 3x$.
- c) Verify that $y_1 = e^{(x^2)}$ satisfies the equation $y'' - 4xy' + (4x^2 - 2)y = 0$.
- d) State the formula for $\frac{1}{D-a} q(x)$ and hence find $\frac{1}{D-2} e^{2x}$.
- e) State the formula for $\frac{1}{f(D)}(xv)$.
- f) State whether true or false. Justify your answer.

$$L\{f_1(t) - f_2(t)\} = L\{f_1(t)\} - L\{f_2(t)\}$$
- g) Find Laplace transform of $\cosh(at)$.
- h) If $L\{f(t)\} = \phi(s)$ then prove that $L\{e^{at} f(t)\} = \phi(s - a)$.
- i) Find $L^{-1}\left\{\frac{1}{s^2 - 4s + 8}\right\}$.
- j) State the Convolution theorem.

P.T.O.

Q2) Attempt any two of the following : **[10]**

- a) Let $f(D)$ be a polynomial in D with constant coefficients. Prove that

$$\frac{1}{f(D)} e^{ax} = \frac{1}{f(a)} e^{ax} \text{ if } f(a) \neq 0.$$

- b) Solve the equation $\frac{d^2 y}{dx^2} + 3 \frac{dy}{dx} + 2y = x \sin 2x$.

- c) Solve the following equation by using the method of undetermined coefficients.

$$(D^2 + 2D + 1)y = x^2 e^{-x}.$$

Q3) Attempt any two of the following : **[10]**

- a) Explain the method of variation of parameter to solve the nonhomogeneous differential equation.

$$\frac{d^2 y}{dx^2} + P_1(x) \frac{dy}{dx} + P_2(x)y = q(x).$$

- b) If $L\{f''(t)\} = \tan^{-1}\left(\frac{1}{5}\right)$, $f(0) = 3$ and $f'(0) = -2$ then find $L\{f(t)\}$.

- c) Find the inverse transform of $\frac{1}{(s+1)(s^2+1)}$ by using convolution theorem.

Q4) Attempt any one of the following : **[10]**

- a) i) If $L\{f(t)\} = \phi(s)$ then prove that $L\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n}(\phi(s))$.
 ii) By using Laplace transform solve the differential equation $y'' + 4y = 8 \cos^2 t$ with the initial conditions $y(\pi) = 4$ and $y'(0) = 4$.

- b) i) If $L^{-1}\{\phi(s)\} = f(t)$ then prove that $L^{-1}\left\{\int_s^\infty \phi(\beta) d\beta\right\} = \frac{f(t)}{t}$.

- ii) Find $L^{-1}\left\{\log \frac{s+7}{s-7}\right\}$



P559

[3617]- 214

S.Y. B.Sc.

STATISTICS

ST - 221 : Statistical Methods - I

(Sem.- II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following :

[1 mark each]

a) Choose the correct alternative in each of the following :

i) The regression planes coincides if

- A) $|R| = 0$ B) $|R| = 1$ C) $|R| > 0$ D) $|R| > 1$

ii) Marshall-Edgeworth price index number uses weight as

- A) Base year quantity.
B) Current year quantity.
C) Arithmetic mean of base year quantity and current year quantity.
D) Geometric mean of base year quantity and current year quantity.

iii) Type - II error is

- A) Rejecting H_0 when it is false.
B) Accepting H_0 when it is false.
C) Accepting H_0 when it is true.
D) Rejecting H_0 when it is true.

b) State whether the given statement is true or false in each of the following:

[1 mark each]

i) $R_{1.23} \leq \max \{ |r_{12}|, |r_{13.2}| \}$.

ii) Real wages are actual wages divided by cost of living index number.

iii) If price index number $P_{01} = 125$ then it is interpreted as the price of the commodity is increased by 125%.

c) Why the Fisher's index number is called ideal index number? **[1]**

d) If $\sum p_1 q_0 = 750$, $\sum p_1 q_1 = 860$, $\sum p_0 q_0 = 700$, $\sum p_0 q_1 = 830$, find the Paasche's price index number. **[1]**

P.T.O.

- e) In test of significance for equality of proportions $n_1 = 100$, $n_2 = 200$, $p_1 = 0.8$, $p_2 = 0.7$ then find the pooled estimate of P. [1]
- f) State central limit theorem. [1]

Q2) Attempt any two of the following : [5 mark each]

- a) For a trivariate data, define multiple correlation coefficient $R_{1.23}$. Show that $R_{1.23}$ lies between 0 and 1.
- b) What is factor reversal test? Check whether Laspeyre's index number satisfies factor reversal test.
- c) A market research group found that the correlation coefficient between sales and expenditure on advertisement with the help of a sample of 103 observations is 0.5. Can we conclude that this sample is drawn from the population having population correlation coefficient at least 0.6? Use 5% level of significance.

Q3) Attempt any two of the following : [5 mark each]

- a) Derive expression for the partial correlation coefficient $r_{12.3}$.
- b) Discuss the following problems arising in construction of index numbers:
- Selection of averages.
 - Selection of weights.
- c) Describe large sample test for testing $H_0 : P = P_0$ against the alternative.
- $H_0 : P \neq P_0$
 - $H_0 : P < P_0$
 - $H_0 : P > P_0$, when a sample of size n is drawn from the population with proportion of certain type of items P.

Q4) Attempt any one of the following :

- a) i) Derive the equation of least squares regression plane of X_1 on X_2 and X_3 . [7]
- ii) Compute appropriate quantity index number for year 2008 by taking 2005 as a base year for the following data : [3]

Commodity	2005		2008
	Price (Rs.)	Quantity (kg.)	Quantity (kg.)
A	40	20	25
B	30	25	30
C	10	30	30

- b) i) A group of 50 operators working with method A produce on an average 650 items with standard deviation 100 items. A group of 35 operators working with method B produce on an average 615 items with standard deviation 63 items. Do we conclude that method A produces average number of items more than that of method B? Use 1% level of significance. [6]
- ii) Show that the condition for consistency of given total correlation coefficients is

$$r_{12}^2 + r_{13}^2 + r_{23}^2 - 2r_{12} r_{13} r_{23} \leq 1. \quad [4]$$



P560

**[3617]- 215
S.Y. B.Sc.
STATISTICS**

**ST - 222 : Continuous Probability Distributions - II
(Sem.- II)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of calculator and statistical tables is allowed.*
- 4) Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following :

a) Choose the correct alternative for each of the following : **[1 mark each]**

i) Suppose X and Y are independent and identically distributed

(i. i. d.) $G(1,1)$ variates, then the distribution of $\frac{Y}{X+Y}$ is ———

I) $\beta_2(1,1)$

II) $\beta_1(1,1)$

III) $\beta_1\left(\frac{1}{2}, \frac{1}{2}\right)$

IV) $\beta_2\left(\frac{1}{2}, \frac{1}{2}\right)$

ii) If X follows Chi-Square distribution with mode equal to 8 then the mean of the distribution is

I) 8

II) 4

III) 10

IV) 6

iii) If $X \rightarrow F_{(5, 3)}$ and $Y \rightarrow F_{(3, 5)}$ and $P[X \geq 5] + P[Y \geq a] = 1$ then the value of constant 'a' is

I) 5

II) $\frac{3}{5}$

III) 3

IV) $\frac{1}{5}$

b) State whether following statements are true or false : [1 mark each]

i) Mean of $F_{(6,4)}$ is same as mean of $F_{(3,4)}$.

ii) To test independence of two attributes A and B, a 4×3 contingency table is obtained then the distribution of statistic under H_0 is χ^2_{11} .

iii) If X follows $\beta_2(m,n)$ then $Y = \frac{X}{1-X}$ follows $\beta_1(n,m)$.

c) State the additive property of two independent Chi-square variates. [1]

d) If T follows t distribution with 10 degrees of freedom, find $P[|T| \geq 1.812]$. [1]

e) Give one real life situation where Chi-Square test for goodness of fit can be used. [1]

f) State the inter-relation between Student's t and Snedecor's F distribution. [1]

Q2) Attempt any two of the following : [5 mark each]

a) If X follows $\beta_1(m,n)$ with $m > 1$, $n > 1$, obtain arithmetic mean and harmonic mean of X.

b) Obtain the moment generating function of Chi-Square distribution with n degrees of freedom (d.f.) and hence find its mean.

c) Explain the term sampling distribution of a statistic. Also obtain the sampling distribution of sample mean if a random sample of size n is drawn from Gamma(α, λ) distribution.

Q3) Attempt any two of the following : [5 mark each]

a) Describe the test procedure for testing $H_0 : \sigma_1^2 = \sigma_2^2$ against $H_1 : \sigma_1^2 \neq \sigma_2^2$.

- b) If $F \rightarrow F_{n_1, n_2}$ then find the probability distribution of $n_1 F$ as $n_2 \rightarrow \infty$.
- c) Following data were obtained in a survey of 500 individuals. Do the data support the claim that interest in political activities is associated with level of education? Use 1% level of significance (l.o.s.)

Interest in political activities	Level of Education	
	Graduate	Non-graduate
Yes	170	190
No	135	5

Q4) Attempt any one of the following :

- a) i) Define Student's t distribution with n degrees of freedom and derive its probability density function. [7]
- ii) If X_1, X_2, \dots, X_{10} are i.i.d. random variables following $N(0,1)$ distribution and $U = \frac{9X_{10}^2}{(X_1^2 + X_2^2 + \dots + X_9^2)}$, find α such that $P[U \geq \alpha] = 0.01$. [3]
- b) i) If X and Y are independent Chi-Square variates with m and n d.f. respectively then show that, $X + Y$ and $\frac{X}{Y}$ are independently distributed. [5]
- ii) Describe paired t test with one illustration. [5]



P562**[3617] - 102****S.Y. B.Sc.****MATHEMATICS****MT : 212 (A) and MT - 212 (B)****MT - 212 (A) : Differential Equations****(Sem.- I) (New Course) (Paper - II)***Time : 2 Hours]**[Max. Marks : 40**Instructions to the candidates:*

- 1) *Candidates are advised to see the relevant question paper and solve the same.*
- 2) *All questions are compulsory.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :**[10]**

- a) State the order and degree of the equation.

$$\sqrt{\frac{d^2 y}{dx^2} - \left(\frac{dy}{dx}\right)^3} = \frac{4}{\frac{d^3 y}{dx^3}}.$$

- b) Test whether the differential equation is exact or not $(e^y + 1) \cos x dx + e^y \sin x dy = 0$.
- c) Find the integrating factor of the differential equation $(x^2 + y^2 + 2x) dx + 2y dy = 0$.
- d) Define orthogonal trajectories.
- e) Find, by inspection method, the particular solution of the differential equation $(D^3 + 5D)y = 15$.
- f) Find particular solution of the differential equation $\frac{d^3 y}{dx^3} + 9 \frac{dy}{dx} = \cos 3x$.
- g) Verify that $y_1 = \sin x$ is a solution of differential equation

$$\frac{d^2 y}{dx^2} - 2 \tan x \frac{dy}{dx} + 3y = 0.$$

P.T.O.

- h) If $f(D) \equiv x^2 D + 4$ and $g(D) \equiv D + 3$, then find $[f(D)g(D)]y$, where $D \equiv \frac{d}{dx}$.
- i) Evaluate, $\frac{1}{D+1} e^{2x}$.
- j) Find the roots of the auxiliary equation of the differential equation $(D^3 - 3D^2 - 6D + 8)y = 0$.

Q2) Attempt any two of the following : **[10]**

- a) Explain the method of solving the homogeneous differential equation

$$\frac{dy}{dx} = \frac{f(x, y)}{g(x, y)}.$$

Where $f(x, y)$ and $g(x, y)$ are homogeneous function of same degree.

- b) Solve the differential equation $\frac{dy}{dx} = \frac{4x-6y+3}{6x-9y-1}$.
- c) Solve the differential equation. $y(xy + 2x^2y^2) dx + x(xy - x^2y^2) dy = 0$.

Q3) Attempt any two of the following : **[10]**

- a) Let $f(D)$ be a polynomial in $D \equiv \frac{d}{dx}$ with constant coefficients and V be

a function of x then prove that $\frac{1}{f(D)} e^{ax} V = e^{ax} \frac{1}{f(D+a)} V$.

- b) Solve $(1 + x^2) \frac{dy}{dx} + 2xy - 1 = 0$.
- c) Find the orthogonal trajectories of the family $\frac{x^2}{a^2} + \frac{y^2}{a^2 + \lambda} = 1$. Where λ is a parameter.

Q4) Attempt any one of the following :

[10]

- a) i) Explain the method of solving the linear non-homogeneous

differential equation $\frac{d^2 y}{dx^2} + P_1(x) \frac{dy}{dx} + P_2(x) y = q(x)$.

by using variation of parameter.

- ii) Solve $(D^2 + 4)y = x \sin x$.
- b) i) Use the method of reduction of order to solve $(D^2 - 5D + 6)y = 2e^x$.
- ii) Solve $(D^2 + 4D - 12)y = (x - 1) e^{2x}$.



P562**[3617] - 102****S.Y. B.Sc.****MATHEMATICS****MT - 212 (B) : Numerical Analysis****(Sem.- I) (New Course) (Paper - II)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:**

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator is allowed.

Q1) Answer the following questions :**[10]**

- a) An approximate value of π is 3.14278152 and it's true value is 3.14159265. Find the absolute and relative errors.
- b) Show that the equation $x^{10} - 4x^6 + x^4 - 2x - 3 = 0$ has at least four imaginary roots.
- c) State Strum's theorem.
- d) Show that $(1 + \Delta)(1 - \nabla) \equiv 1$.
- e) Is it possible to apply Newton - Gregory formula for interpolation to estimate $f_{(2)}$ from the following table ; justify.

x	:	-1	0	1	3	4
$f(x)$:	3	1	7	12	19

- f) Round off and state the significant digits in the number 1234×10^{-5} .
- g) Find the function whose first forward difference is e^x .
- h) Is it possible to solve the system of equations

$$4x - y = 7$$

$$5x + 2y = 11$$
 by Gauss - seidel iterative method? Justify.
- i) Using Euler's method find $y(0.1)$. Given that $\frac{dy}{dx} + 2y = 0$; $y(0) = 1$.
- j) State the normal equations to fit a second degree polynomial for the given data.

P.T.O.

Q2) Attempt any two of the following : **[10]**

- a) Obtain Newton - Raphson formula to find the r^{th} root of a given number 'C' and hence estimate the value of $\sqrt[3]{13}$ by taking two iterations. [Take $x_0 = 2.5$].
- b) Solve the following system of equations
- $$\begin{aligned} 10x + 2y + z &= 9 \\ x + 10y - z &= -22 \\ 2x + 3y + 10z &= 22 \end{aligned}$$
- by Gauss - Seidel iteration method. [Take 2 iterations].
- c) Find a real root of the equation $x^3 - 9x + 1 = 0$ lying between 2 and 4 by Regula - Falsi method. [Take 2 iterations].

Q3) Attempt any two of the following : **[10]**

- a) Prove Newton's divided difference interpolation formula for the arguments $x_0, x_1, x_2, \dots, x_n$ not necessarily equally spaced.
- b) Find the cubic polynomial in x for the following data :

x	:	0	1	2	3
$y = f(x)$:	1	0	1	10

and hence obtain $f(4)$.

- c) Using Lagrange's interpolation formula, estimate y at $x = 8$ from the following data :

x	:	3	7	9	10
y	:	168	120	72	63

Q4) Attempt any one of the following : **[10]**

- a) i) State general Quadrature formula and hence derive Simpson's $\frac{1^{\text{rd}}}{3}$ rule for numerical integration.
- ii) Given $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$. Determine $y(0.02)$ using Euler's modified method. (Take $h = 0.01$).

b) i) Given the following data :

x :	0	10	20	30	40	50	60	70	80
y :	0	4	7	9	12	15	14	8	3

Evaluate $\int_0^{80} y dx$ by Trapezoidal rule.

ii) Given that $\frac{dy}{dx} = x + y$; $y(0) = 1$. Use Runge - Kutta second order formula to approximate y when $x = 0.1$ and $x = 0.2$.



P563

[3617]-111
S.Y. B.Sc.
GEOLOGY
GL - 211: Mineralogy
(New Course) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following questions in two or three lines :

[10]

- a) Define oblique extinction.
- b) What are Orthopyroxenes?
- c) Define a Twin crystal.
- d) What is perthite?
- e) What are non crystalline minerals?
- f) State the silicate structure of chlorite minerals.
- g) What are offset crystals?
- h) Define hemihedral form.
- i) What is Baveno twinning?
- j) Define Anisotropism.

Q2) Write notes on : (Any two)

[10]

- a) Main attributes of a gemstone.
- b) Elements of symmetry and forms of Type Tetrahedrite
- c) Phenomenon of Isotropism.

P.T.O.

Q3) Explain the following : (Any two) **[10]**

- a) Chemical composition and physical properties of silica minerals.
- b) Classification of twins.
- c) Classification of minerals based on silicate structure.

Q4) Describe the silicate structure, chemical composition, physical and optical properties and paragenesis of 'Amphibole' group of minerals. **[10]**

OR

Describe the silicate structure, chemical composition, physical and optical properties and paragenesis of 'Mica' group of minerals.



Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617]- 112

S.Y. B.Sc.

GEOLOGY

**GL - 212 : Structural Geology
(New Course) (Sem.- I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following questions in two or three lines : **[10]**

- a) Define dip of a bed.
- b) What is recumbent fold?
- c) Give any two uses of clinometer compass.
- d) Give any two methods of representation of folds.
- e) Define relative movement along fault.
- f) Define compression.
- g) Define separation along fault.
- h) What is plunge of a linear feature?
- i) Define unconformity.
- j) Define hinge of the fold.

Q2) Write notes on (any two) : **[10]**

- a) Plunging and non plunging fold.
- b) Classification of fault based on rake of the net slip.
- c) Stages in development of unconformity.

P.T.O.

Q3) Explain the following (any two) : **[10]**

- a) Geometrical classification of joints.
- b) Determination of top of bed with the help of ripple marks.
- c) Concept of fold systems.

Q4) What are faults. Describe with suitable examples the effect of faulting on disrupted strata. **[10]**

OR

Define fold. Explain the recognition of fold by topographic studies.



P565**[3617] - 113****S.Y. B.Sc.****STATISTICS****ST - 211 : Discrete Probability Distributions and Time Series****(Sem.- I) (Paper - I) (New Course)***Time : 2 Hours]**[Max. Marks : 40**Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbol and abbreviations have their usual meanings.*

Q1) Attempt each of the following :

- a) Choose the correct alternative in each of the following : **[1 each]**
 - i) If the cumulative generating function (c.g.f.) of a discrete random variable (r.v.) X is $K_x^{(t)} = 5(e^t - 1)$ then variance of X is equal to :
A) 5 B) 10 C) 25 D) 50
 - ii) In $M / M / 1$: FIFO model of queuing theory, the probability that the server is idle is :
A) λ/μ B) $1 - \lambda/\mu$ C) μ/λ D) $1 - \mu/\lambda$.
 - iii) If X and Y are independent Poisson variates with means 4 and 6 respectively, then the conditional distribution of X given $(X + Y = 5)$ is :
A) $B(10, 4/10)$ B) $B(10, 6/10)$
C) $B(5, 4/10)$ D) $B(5, 6/10)$.
- b) State whether the given statement is true or false in each of the following : **[1 each]**
 - i) If X and Y are two discrete r.v.s. then

$$M_{x+y}^{(t)} = M_{x,y}^{(t,t)}$$
 - ii) For geometric distribution, mean and variance are equal.
 - iii) Seasonal variations have period less than one year.

P.T.O.

- c) State additive property of c.g.f. of a discrete r.v. [1]
 d) State relation between geometric distribution and negative binomial distribution. [1]
 e) If the probability mass function (p.m.f.) of a discrete r.v. X is

$$P(X = x) = K \frac{e^{-1}}{x!} \quad ; \quad x = 0, 1, 2, \dots$$

$$= 0 \quad ; \quad \text{otherwise.}$$

then find the value of K. [1]

- f) Give a real life situation where Poisson distribution is applicable. [1]

Q2) Attempt any two of the following : [5 each]

- a) Define distribution function of a discrete r.v. X and state its properties.
 b) The joint p.m.f. of discrete r.v.s. X and Y is given by

$$p(x, y) = \frac{m^y e^{-2m}}{x! (y-x)!} \quad ; \quad x = 0, 1, \dots, y.$$

$$y = 0, 1, \dots$$

$$m > 0$$

$$= 0 \quad ; \quad \text{otherwise}$$

Find the conditional distribution of X given Y = y. Also find E(X | Y = y).

- c) A selection committee interviews the candidates for 3 posts of the same rank. If the probability that a candidate is found suitable is 0.7, what is the probability that the committee has to interview 10 candidates to fulfill its requirement?

Q3) Attempt any two of the following : [5 each]

- a) If $X \rightarrow P(m)$ then, show that

$$\mu'_{r+1} = m \left[\mu'_r + \frac{d \mu'_r}{d m} \right].$$

- b) State and prove lack of memory property of geometric distribution.
 c) Let X be a discrete r.v. with p.m.f.

$$p(x) = {}^n C_x p^x q^{n-x} \quad ; \quad x = 0, 1, \dots, n.$$

$$0 < p, q < 1$$

$$p + q = 1$$

$$= 0 \quad ; \quad \text{otherwise.}$$

Find the moment generating function (m.g.f.) of r.v.x. Hence find its mean.

Q4) Attempt any one of the following :

a) i) Show that under certain conditions to be stated, negative binomial distribution tends to Poisson distribution. [6]

ii) The total sales of a company is expected to be Rs. 40 lakhs during the year. Find expected sales in each quarter, given the quarterly indices of sales as follows :

Quarter	I	II	III	IV
Seasonal Index	91.67	117.22	102.29	88.22

 [4]

b) i) Customers arrive at a petrol pump in a Poisson Process with an average time of 5 minutes between successive arrivals. The time intervals between services at the petrol pump follow exponential distribution and the mean time taken to service a vehicle is 2 minutes. What is expected length of the system? Also obtain the average time spent by a customer in the system. [6]

ii) Distinguish between seasonal variation and cyclical variation. [4]



P566**[3617]-114****S.Y. B.Sc.****STATISTICS****ST - 212 : Continuous Probability Distributions - I****(Paper - II) (New Course) (Semester - I)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:**

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of calculator and statistical tables is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following :a) Choose the correct alternative in each of the following : **[1 each]**

i) Let X be a continuous random variable (r.v.) with moment generation

function (m.g.f.) $M_X(t)$. If $Y = \frac{X-a}{h}, h \neq 0$ then m.g.f. of Y is :

A) $e^{-at} M_X(t)$

B) $e^{-\frac{at}{h}} M_X\left(\frac{t}{h}\right)$

C) $e^{-at} M_X\left(\frac{t}{h}\right)$

D) $M_X\left(\frac{t}{h}\right)$

ii) If (X, Y) is a continuous bivariate r.v. then $E(X | Y = y)$ is a function of

- A) Y
- B) X
- C) both X and Y
- D) None of the above.

P.T.O.

- iii) If $X \rightarrow N(2, 4)$ then $Y = X/2$ follows
- $N(4, 16)$
 - $N(4, 8)$
 - $N(1, 1)$
 - $N(1, 2)$
- b) State whether the given statement is true or false in each of the following: **[1 each]**
- If $X \rightarrow \exp(\alpha)$ then r^{th} raw moment of X is $\frac{r!}{\alpha^r}$.
 - If (X, Y) is a continuous bivariate r.v. then $E(XY) = E(X) E(Y)$ always.
 - Let $X \rightarrow G(\alpha, \lambda)$ then $Y = cX \rightarrow G(c\alpha, \lambda)$, $c > 0$.
- c) Define expectation of a continuous r.v. X **[1]**
- d) A Continuous r.v. X has distribution function
- $$F(x) = 0, x < 3$$
- $$= 1 - \frac{9}{x^2}, x \geq 3$$
- Find the p.d.f. of X . **[1]**
- e) Define conditional distribution of X given $Y = y$. **[1]**
- f) Define moment generating function of bivariate continuous r.v. (X, Y) . **[1]**

Q2) Attempt any two of the following : **[5 each]**

- a) Define uniform distribution. If $X \rightarrow U(a, b)$, find mean of X . Also find the probability distribution of $Y = \frac{X-a}{b-a}$.
- b) A continuous r.v. X has the p.d.f.
- $$f(x) = 6(2-x)(x-1), 1 \leq x \leq 2$$
- $$= 0, \text{ otherwise}$$
- Find mean and mode of the probability distribution.
- c) The joint p.d.f. of (X, Y) is
- $$f(x, y) = x + y, 0 \leq x \leq 1, 0 \leq y \leq 1$$
- $$= 0, \text{ otherwise}$$

Find :

i) $P(X \leq Y)$

ii) $P\left(Y \geq \frac{1}{2}\right)$.

Q3) Attempt any two of the following :

[5 each]

a) State and prove additive property of normal distribution.

b) If $X \rightarrow N(\mu, \sigma^2)$, then show that $\mu_{2r} = \frac{(2r)! \sigma^{2r}}{2^r r!}$.

c) The p.d.f. of bivariate continuous r.v. (X, Y) is

$$f(x, y) = 8xy, \quad 0 < x < y < 1$$

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

Find:

i) Marginal probability distributions of X and Y

ii) Are X and Y independent?

Q4) Attempt any one of the following :

a) i) Let $X \rightarrow \exp(\alpha)$. Find the quartile deviation of X.

[5]

ii) The p.d.f. of continuous r.v. X is

$$f(x) = \frac{3x(2-x)}{4}, \quad 0 \leq x \leq 2$$

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

Find :

I) mean of X

II) mean deviation about mean.

[5]

b) i) Let $X \rightarrow G(\alpha, \lambda)$. Obtain the expression for r^{th} raw moment of X. Hence find mean and variance of X.

[5]

ii) Let $X \rightarrow G(9, 4)$ and $X \rightarrow G(12, 5)$. If X and Y are independent r.v.s. then find the probability distribution of $Z = 3X + 4Y$.

[3]

iii) Let $X \rightarrow N(20, 25)$. Find $P(15 \leq X \leq 25)$.

[2]



Total No. of Questions : 4]

[Total No. of Pages : 2

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S.Y. B.Sc.

MICROBIOLOGY

MB - 211 : Microbial Physiology

(Paper - I) (New Course) (Sem.- I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following (All questions are compulsory) : **[10]**

- a) Define angular velocity.
- b) What are activators of enzyme? Give one example.
- c) Define radioisotope with example.
- d) Name any two electron carriers in aerobic respiration.
- e) Enlist cofactors and coenzymes required in conversion of pyruvate to acetyl CoA.
- f) Write the chemical reaction of formation of ethanol from pyruvic acid.
- g) State principle of partition chromatography.
- h) What are constitutive enzymes? Give one example.
- i) Define respiration.
- j) Write any one difference between UV spectrophotometer and visible spectrophotometer.

Q2) Attempt any two : **[10]**

- a) Explain autoradiography as a technique in radiobiology.
- b) Explain induced fit hypothesis.
- c) Explain homolactic fermentation pathway with chemical structures.

Q3) Attempt any two : **[10]**

- a) What is ultracentrifugation? Explain density gradient centrifugation.

P.T.O.

- b) What is active site? Explain properties of active site of an enzyme.
- c) Explain chemiosmotic hypothesis of ATP formation.

Q4) Attempt any one of the following : **[10]**

- a) Explain classification of enzyme according to IUB. Describe in detail isomerases class and subclass with two suitable examples.
- b) Explain TCA cycle with chemical structure and energetics.



Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617]- 118

S.Y. B.Sc.

MICROBIOLOGY

MB - 212 : Microbial Genetics

(Paper - II) (New Course) (Sem.- I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following (All sub questions are compulsory) : **[10]**

- a) Define translation.
- b) What is missense mutation?
- c) Write two examples of intercalating agents.
- d) Draw the chemical structure of cytosine.
- e) What is semiconservative mode of DNA replication?
- f) All of the following refer to both cytosine and uracil, except
 - i) Both are nitrogenous bases.
 - ii) Both are pyrimidines.
 - iii) Both may be found in RNA.
 - iv) Both may be found in DNA.
- g) What is degeneracy of genetic code?
- h) Define periodic selection.
- i) Enlist enzymes which take part in DNA replication.
- j) In mitochondria, mechanism of DNA replication is by ———.

Q2) Attempt any two of the following : **[10]**

- a) Justify : DNA is the genetic material by Griffith's experiment.
- b) Explain the structure of B form of DNA.
- c) Describe the mechanism of DNA replication with the help of rolling circle model.

P.T.O.

Q3) Attempt any two of the following : **[10]**

- a) Describe DNA replication by Messelson and stahl experiment.
- b) Describe the mutagenic action of Alkylating Agents.
- c) Explain the process of translation in prokaryotes.

Q4) Attempt any one of the following : **[10]**

- a) What is supercoiling of DNA. Explain it with reference to
 - i) Linking number.
 - ii) Topoisomerases.
 - iii) Gyrases.

OR

- b) Enlist the physical and chemical mutagens. Explain the mutagenic action of radiations.



P569**[3617] - 121****S.Y. B.Sc. (Sem. - I)****STATISTICAL TECHNIQUES****STT - 211 : Statistical Techniques - I****(New Course) (Paper - I)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:-**

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following:**[1 each]**

a) Choose the correct alternative in each of the following:

i) If X is a geometric random variable (r.v.) taking non-negative integer values then mean of X is :

A) $\frac{1}{p}$

B) $\frac{q}{p}$

C) $\frac{p}{q}$

D) $\frac{p}{q^2}$

ii) If $X \sim \text{NB}(k, p)$, such that $E(X) = 12$ and $V(X) = 36$ then :

A) $k = 6, p = \frac{1}{3}$

B) $k = 6, p = \frac{2}{3}$

C) $k = 18, p = \frac{1}{3}$

D) $k = 18, p = \frac{2}{3}$

iii) The multiple correlation coefficient lies between :

A) -1 to 1

B) 0 to 1

C) $-\infty$ to ∞

D) 0 to ∞

P.T.O.

- b) State whether each of the following statements is true or false : **[1 each]**
- The quartiles of $N(\mu, \sigma^2)$ distribution are $Q_1 = \mu - \sigma$ and $Q_3 = \mu + \sigma$.
 - If $X \sim E \times P(\alpha)$ then $P(X \geq 5 | X \geq 3) = P(X \geq 2)$.
 - $R_{1.23} = 1$ implies $R_{2.13} = 1$.
- c) State the real life situation where geometric distribution is applicable. **[1]**
- d) State the probability mass function (p.m.f.) of multinomial distribution with parameters (n, p_1, p_2, p_3) . **[1]**
- e) Define partial correlation coefficient $r_{12.3}$ **[1]**
- f) State De Moivre's theorem on normal approximation to binomial distribution. **[1]**

Q2) Attempt any two of the following: **[5 each]**

- Define negative binomial distribution. State its mean and variance. State the relationship between geometric distribution and negative binomial distribution. Also state additive property of negative binomial distribution.
- The life time in hours of a certain electric component follows exponential distribution with distribution function

$$F(x) = 1 - e^{-0.004x}; x \geq 0$$
 Find i) The probability that the component will survive upto 200 hours?
 ii) The probability that it will fail during 250 and 350 hours?
- A certain test yields a positive reaction with probability 0.35. What is the probability that the first positive reaction occurs after seventh negative reaction? Also find the expected number of negative reactions before getting first positive reaction.

Q3) Attempt any two of the following: **[5 each]**

- Define normal distribution. State its mean and variance. Comment on the nature of its probability curve. Illustrate any two real life situations where normal distribution is applicable.
- A machinist keeps a large number of washers in a drawer. 50% of these washers are of type A, 30% are of type B and the remaining 20% are of type C. If 10 washers are chosen at random, what is the probability that there are exactly five washers are of type A, four of type B and one of type C.
- In a trivariate data, $r_{12} = 0.7$, $r_{13} = r_{23} = 0.5$, find $R_{1.23}$ and $r_{13.2}$.

Q4) Attempt any one of the following:

- a) i) A person fires shots at a target until he hits the target for the second time. The probability that a shot hits the target in an attempt is 0.8. Assuming independence of attempts, find the probability that he hits the target for the second time in five shots. [4]
- ii) A monthly balance in the bank account of credit card holders is assumed to be normally distributed with mean Rs. 5000 and standard deviation Rs. 1000. Find the proportion of credit card holders with balance [6]
- A) over Rs. 6500
B) between Rs. 4000 and Rs. 6000.
- b) i) Derive the equation of multiple plane of X_1 on X_2 and X_3 by the method of least squares. [7]
- ii) A fair coin is tossed 400 times. Using normal approximation, find the probability of getting number of heads less than 185. [3]



P571

[3617]-123

S.Y. B.Sc.

ELECTRONIC SCIENCE

EL - 211: Analog Circuits and Systems - I

(Paper - I) (New Course) (Semester - I) (22211)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt ALL of the following :

- a) Define CMRR and state its ideal value. **[1]**
- b) What is piezo-electric effect? **[1]**
- c) What is the output impedance of an ideal OP-AMP. **[1]**
- d) Give advantages of single ended transformer coupled amplifiers. **[1]**
- e) Push-pull amplifiers uses complementary symmetry. Comment. **[2]**
- f) Heat sinks are used with power amplifiers. **[2]**
- g) Voltage gain of first stage amplifier and second stage amplifiers is 40 dB and 60 dB. Calculate total voltage gain. **[2]**
- h) An amplifier has a gain of 2×10^3 without feedback. Determine the gain if negative feedback of 0.03 is applied. **[2]**

Q2) Attempt any TWO of the following :

- a) Draw the circuit diagram of a class-A audio amplifier. Perform DC analysis and draw DC load line with suitable output characteristics. **[4]**
- b) Draw a neat circuit diagram of I - to - V converter. Give an expression for its output voltage. **[4]**
- c) Draw the circuit diagram of phase-shift oscillator. Explain the working in brief. Give expression for frequency determination in it. **[4]**

P.T.O.

Q3) Attempt any TWO of the following :

- a) Explain the concept of differential amplifier using a black box. [4]
- b) Explain thermal run away? Define thermal resistance. [4]
- c) Draw the classification of an amplifiers. [4]

Q4) Attempt ALL of the following :

- a) Explain the working of a precision rectifier circuit. Give its applications. [6]
- b) Draw the neat circuit diagram of a class-B push-pull amplifier and explain its working. Show that the conversion efficiency (η) of class-B push-pull amplifier is 78.5%. [6]

OR

Attempt ALL of the following :

- a) Design a voltage divider circuit for a CE amplifier with $I_C = 10\text{mA}$, $V_{CC} = +10\text{ volts}$ and $\beta = h_{fe} = 200$, $V_{BE} = 0.7\text{V}$. [4]
- b) Calculate the amount of maximum permissible power that a transistor can safely dissipate in free air if $T_A = 30^\circ\text{C}$, $T_J = 90^\circ\text{C}$ and $\theta = 300^\circ\text{C/W}$ with and without heat sink if same transistor with $\theta = 60^\circ\text{C/W}$ value. [4]
- c) A basic differentiator circuit has a capacitance of $0.1\ \mu\text{F}$ and feedback resistor $1\ \text{k}\Omega$. A sine wave of 1V peak and frequency of $1\ \text{kHz}$ is given as input to the differentiator. Determine the amplitude of the output waveform. Also sketch the input vs output waveforms. [4]



P572

[3617]-124

S.Y. B.Sc.

ELECTRONIC SCIENCE

EL - 212: Electronic Instrumentation

(Paper - II) (New Course) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw the neat diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable calculator is allowed.*

Q1) Answer all of the following :

- a) Define precision of a measuring instrument. [1]
- b) State the range of the pH meter. [1]
- c) Write the full form of PMMC. [1]
- d) Enlist any two physical parameters with units. [1]
- e) "Least count of the analog multimeter is vital in measurements" - Comment. [2]
- f) "For sine wave output in function generator special output amplifier is needed" - Comment. [2]
- g) A digital voltmeter reads 4.5 volts and the true value is 5.0 volt. Determine the absolute and percentage error. [2]
- h) A 33 ohm resistor is to be measured using digital multimeter what will be read out at 100 Ω , 1k Ω ranges. [2]

Q2) Attempt any two of the following :

- a) Compare the dual trace oscilloscope with the dual beam oscilloscope. [4]
- b) How the use of microcontroller enhances the performance of digital thermometer. [4]
- c) With a neat block diagram explain the working of function generator. [4]

P.T.O.

Q3) Attempt any two of the followings :

- a) Draw the block diagram of dual power supply. What precautions should be taken while using dual power supply. [4]
- b) How multirange voltmeter is constructed using basic D' Arsonval movement. [4]
- c) State any four specification of the Lase meter you have studies. What precautions should be taken while using the Lase meter. [4]

Q4) Attempt any two of the following :

- a) Draw neat labeled diagram of dual trace CRO. Explain the working of X-Y mode. [6]
- b) Explain the working of an uninterrupted power supply with schematic diagrams for [6]
 - i) On Line UPS and
 - ii) Off Line UPS.
- c) i) Draw the block diagram of signal generator.
ii) Draw the labeled diagram of pH sensor element. [6]

OR

Attempt all of the following :

- a) For a square wave measurement on oscilloscope, the distance between same phase points is 4 divisions on a time base value $5 \mu\text{s}/\text{div}$. If OH time is of 1 division find [4]
 - i) Frequency of the signal and
 - ii) Duty cycle.
- b) Find the percent load regulation for a fixed voltage power supply when load voltage with zero load current is 10V and load with full load current is 9.5 volt. [4]
- c) The D'Arsonval movement has internal resistance 100Ω , full scale deflection current 1mA. Estimate the short resistance to convert this meter for 0-100 mA range. Draw the diagram. [4]



P573

[3617]-128

S.Y. B.Sc.

ENVIRONMENTAL SCIENCE

ENV - 201: Ecology & Ecosystem

(Paper - I) (New Syllabus) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following in 1-2 lines each :

[10]

- a) Define the term Ecosphere.
- b) Give any four types of succession.
- c) What is sedimentary cycle?
- d) What is biotic potential?
- e) Define nitrification.
- f) Give the difference between Ecology & Ecosystem.
- g) What are Eutrophic lakes?
- h) What is Population Density?
- i) Define the term : Age Structure.
- j) What is Homeostasis.

Q2) Write short notes on Any Two of the following each in 8-10 lines.

[10]

- a) Discuss the interdisciplinary nature of ecology & hence its scope.
- b) What is food chain? Explain its type with suitable examples.
- c) Explain Hydrological cycle with diagram.

Q3) Answer Any Two of the following each in 8-10 lines. **[10]**

- a) What is meant by Productivity of an ecosystem. Explain it in detail.
- b) Explain Environmental heterogeneity.
- c) Write a note on : Ecological niche with example.

Q4) Answer Any One of the following in 20-22 lines. **[10]**

- a) Explain Hydrosere Succession in detail with diagram.
- b) Discuss in detail Energy Flow models with diagram.



P574

[3617]-129

S.Y. B.Sc.

ENVIRONMENTAL SCIENCE

ENV - 202: Hydrology

(Paper - II) (New Syllabus) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following in 1-2 lines each :

[10]

- a) Define Hydrology.
- b) What is Magmatic water?
- c) Define evapotranspiration.
- d) What is primary aquifer?
- e) What is meant by salt water intrusion?
- f) Define the term : Agriculture.
- g) What is porosity?
- h) Give any 2 physical properties.
- i) Define - watershed.
- j) Name any 2 traditional methods of water harvesting.

Q2) Write short notes on Any Two of the following each in 8-10 lines.

[10]

- a) Give chemical composition of river & sea.
- b) Write a note on ground water mining.
- c) Write a note on watershed management.

P.T.O.

Q3) Answer Any Two of the following each in 8-10 lines. **[10]**

- a) Describe artificial recharge methods.
- b) Write an account on quality criteria of water for different uses.
- c) Give in detail sources of water pollution.

Q4) Answer Any One of the following in 20-22 lines. **[10]**

- a) Describe saline water intrusion in aquifer & its preventive measures.
- b) Describe some issues related to rain water harvesting.



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[3617] - 138

S.Y. B.Sc. (Vocational)

**COMPUTER HARDWARE AND NETWORK
ADMINISTRATION**

**Microprocessor and Interfacing Technique - I
(Sem.- I) (Paper - I) (58711) (New Course)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) a) Attempt the following : **[4 × 1 = 4]**

- i) Name any two non-intel microprocessor.
- ii) Why PCI bus architecture is most widely used in PC's?
- iii) What do you mean by DMA?
- iv) What is cache memory?

b) Attempt the following : **[4 × 2 = 8]**

- i) What are the different parameters of DAC?
- ii) List the different types of interrupts.
- iii) What is bus? State its different types.
- iv) Explain in brief any two characteristics of a transducer.

Q2) Attempt any two of the following : **[2 × 4 = 8]**

- a) Explain in brief 8086 microprocessor with block diagram.
- b) Write short note on non-interlaced and interlaced scanning.
- c) Explain maximum mode of 8086.

P.T.O.

Q3) Attempt any two of the following : **[2 × 4 = 8]**

- a) Define seeback Effect. Explain the working of thermocouple.
- b) Explain in brief Interrupt Vector Table.
- c) Explain DOS INT 21 H.

Q4) Attempt the following :

- a) i) What do you mean by Microprocessor? List the series of micro-processors introduced by Intel with its speed and memory capacity. **[4]**
- ii) Distinguish between unidirectional and bidirectional buses. **[2]**
- b) Explain successive approximation ADC with neat block diagram. **[6]**



P578

[3617]-145

S.Y. B.Sc. (Vocational)

COMPUTER HARDWARE AND NETWORK ADMINISTRATION

Computer System Management - I

(Paper - II) (New Course) (Semester - I) (58721)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) a) Attempt the following : **[4 × 1 = 4]**

- i) What is the indication of a possible hard disk drive failure?
- ii) Which storage device is normally not affected by virus attacks?
- iii) What single personal attitude during troubleshooting is most important according to you?
- iv) Which diagnostic software detects the primary start-up problems?

b) Attempt the following : **[4 × 2 = 8]**

- i) Describe any two causes for incidents and disasters in a computer system.
- ii) Explain any two display problems that can cause trouble, in brief.
- iii) Write two ways for regular preventive maintenance of a Keyboard.
- iv) Maintenance of which devices ensures error-free power supply to the computer system?

Q2) Attempt any two of the following : **[2 × 4 = 8]**

- a) Describe backup and restore policies which are commonly implemented.
- b) What are the indicators of port failures? Suggest possible procedure for its recovery.
- c) Explain any two environmental contributors to system failures.

Q3) Attempt any two of the following : **[2 × 4 = 8]**

- a) Explain the importance of disaster recovery plan.
- b) Explain two types of access control mechanisms for preventing disasters.
- c) Describe any two ways of implementing disk drive maintenance.

P.T.O.

Q4) Attempt any two of the following **[2 × 6 = 12]**

- a) Describe the general rules and safety precautions that must be adopted during troubleshooting and repairs.
- b) Explain the preventive maintenance of printers in detail.
- c) Describe the most commonly used utilities and softwares for diagnosing failures in a computer system.



P579**[3617] - 151****S.Y. B.Sc.****MATHEMATICS****MT - 211 : Linear Algebra - I****(Sem.- I) (Old Course)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:**

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Answer the following questions in short :**[10]**

- a) If \bar{u} and \bar{v} are vectors in R^n orthogonal to each other with $\|\bar{u}\| = 6$, $\|\bar{u} + \bar{v}\| = 10$, then find $\|\bar{v}\|$.
- b) If $A = \begin{bmatrix} x & 5 \\ y & z \end{bmatrix}$ is skew symmetric matrix then find x, y, z .
- c) If $\bar{u} = (1, -2)$, $\bar{a} = (-4, -3)$ then find $\|\text{proj}_{\bar{a}} \bar{u}\|$.
- d) For what values of the constant k does the following system of linear equations have infinitely many solutions?
$$\begin{aligned} 2x - 2y &= 4 \\ 3x - 3y &= k \end{aligned}$$
- e) Write the matrix $A = \begin{bmatrix} 1 & 0 \\ 2 & 5 \end{bmatrix}$ as a product of two elementary matrices.
- f) Write the standard basis for vector space of all polynomials of degree 3.
- g) Determine whether the set $S = \{(2, -3, 1), (-4, 6, -2), (5, 7, 8)\}$ is linearly dependent. Justify.
- h) State the Dimension theorem for matrices and hence find nullity of matrix A , if A is of order 6×9 and of rank 5.
- i) Determine whether $T : R^3 \rightarrow R^3$ defined by. $T(x, y, z) = (e^x, e^y, 0)$ is linear Transformation.

P.T.O.

- j) Let $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be a linear transformation given by $T(x, y) = (y - 3x, 6x - 2y)$. Which of the vectors $(1, 3)$, $(-2, -6)$ are in $\ker T$?

Q2) Attempt any two of the following : **[10]**

- a) Determine the basis and the dimension for the solution space of the system.

$$x - 3y + z = 0$$

$$2x - 6y + 2z = 0$$

$$3x - 9y + 3z = 0$$

- b) Determine whether the vectors $\bar{u}_1 = (1, -2, 3)$, $\bar{u}_2 = (5, 6, -1)$ and $\bar{u}_3 = (3, 2, 1)$ spans \mathbb{R}^3 .

- c) If \bar{u} , \bar{v} are vectors in \mathbb{R}^n and K is scalar then prove that

i) $\|\bar{u} + \bar{v}\| \leq \|\bar{u}\| + \|\bar{v}\|$ and

ii) $\|\bar{u} + \bar{v}\|^2 = \|\bar{u}\|^2 + \|\bar{v}\|^2$ if \bar{u} and \bar{v} are orthogonal to each other.

Q3) Attempt any two of the following : **[10]**

- a) Solve the system : $-y - z + w = 0$

$$x + y + z + w = 6$$

$$2x + 4y + z - 2w = -1$$

$$3x + y - 2z + 2w = 3$$

by Gaussian elimination method.

- b) Suppose $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$ is a linear transformation defined by $T(x, y, z) = (x + y + z, -y + z)$. Find kernel and range of T .
- c) Let S be a set with two or more vectors in a vector space V then prove that S is linearly dependent if and only if at least one of the vectors in S is expressed as a linear combination of the remaining vectors in S .

Q4) Attempt any one of the following : **[10]**

- a) Let $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ be the linear transformation defined by

$$T(x, y, z) = (x + z, x + y, y - z) \text{ then}$$

i) Compute $T(4, -1, 1)$.

ii) Find $\text{rank}(T)$.

iii) Find $\text{nullity}(T)$.

iv) Verify Rank-Nullity theorem.

- b) i) Let W_1 and W_2 be subspaces of a vector space V . Then show that $W_1 + W_2 = \{\bar{w}_1 + \bar{w}_2 / \bar{w}_1 \in W_1, \bar{w}_2 \in W_2\}$ is a subspace of V .
- ii) Explain why the set of vectors,
 $S = \{1 - 3x + 2x^2, 1 + x + 4x^2, 1 - 7x\}$ is not basis for the vector space P_2 .



P580**[3617] - 152****S.Y. B.Sc.****MATHEMATICS****MT - 212 : Calculus of Several Variables****(Sem.- I) (Old Course)***Time : 2 Hours]**[Max. Marks : 40**Instructions to the candidates:*

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt the following questions :**[10]**

- a) Define both the repeated limits of a function of two variables.
- b) If $U = x^2 (y - z) + y^2 (z - x) + z^2 (x - y)$ then show that $U_x + U_y + U_z = 0$.
- c) Let $f(x, y) = x y e^{2y/x} + y^2 \log_e \left(\frac{x}{y} \right)$. Test whether $f(x, y)$ is a homogeneous function. If so, find its degree.
- d) Find the domain of the function

$$f(x, y) = \log_e (x^2 + y^2 - 9).$$
- e) Determine the critical points of

$$f(x, y) = x^3 + y^3 - 3axy.$$
- f) Determine whether the simultaneous limit

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 y^3}{x^4 + y^6} \text{ exist or not.}$$

- g) If $x - y = u$, $x + y = v$ then calculate

$$J = \frac{\partial (x, y)}{\partial (u, v)}.$$

- h) Find the area of the rectangle bounded by $x = 1$, $x = 3$; $y = 2$, $y = 5$ by using double integration.
- i) Change the order of integration of

$$\int_{x=0}^a \int_{y=0}^{\sqrt{a^2-x^2}} f(x, y) dy dx.$$

- j) State Young's theorem.

P.T.O.

Q2) Attempt any two of the following : **[10]**

- a) If $U = f(x, y)$ is a differentiable function of x and y , $x = \phi(t)$, $y = \psi(t)$ are differentiable functions of 't' then prove that $U = f(\phi(t), \psi(t))$ is

differentiable function of 't' and $\frac{\partial U}{\partial t} = \frac{\partial U}{\partial x} \frac{\partial x}{\partial t} + \frac{\partial U}{\partial y} \frac{\partial y}{\partial t}$.

- b) Find the approximate value of $[(3.82)^2 + 2(2.1)^3]^{1/5}$ using differentials.

- c) If $f(x, y) = \frac{x^2 y^2 (x^2 - y^2)}{x^2 + y^2}$, $(x, y) \neq (0, 0)$
 $= (0, 0)$, $(x, y) = (0, 0)$.
 find $f_{yx}(0, 0)$.

Q3) Attempt any two of the following : **[10]**

- a) State Euler's theorem for homogeneous function and verify Euler's theorem for

$$U = \frac{x^2 y^2}{x^2 + y^2}.$$

- b) Find 3 positive numbers whose sum is 30 and whose product is maximum.
- c) If $W = f(y - x, z - y)$ then prove that

$$\frac{\partial W}{\partial x} + \frac{\partial W}{\partial y} + \frac{\partial W}{\partial z} = 0.$$

Q4) Attempt any one of the following : **[10]**

- a) State Taylor's theorem and expand $\sin(xy)$ in powers of $(x - 1)$ and

$\left(y - \frac{\pi}{2}\right)$ upto 2nd degree terms and hence find the value of $\sin\left(\frac{\pi}{2}\right)$.

- b) i) Evaluate $\iint_R \sqrt{x^2 + y^2} \, dx \, dy$ where R is a region in xy - plane bounded by $x^2 + y^2 = 4$ and $x^2 + y^2 = 9$.

ii) Evaluate $\int_{x=0}^1 \int_{y=0}^1 \int_{z=\sqrt{x^2+y^2}}^2 xyz \, dx \, dy \, dz$.



P581**[3617] - 153****S.Y. B.Sc. (Sem. - I)****MATHEMATICS****MT - 213 & MT - 214 (Old Course)****MT - 213 : Ordinary Differential Equations****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:-**

- 1) *Candidates are advised to see the relevant question paper and solve the same.*
- 2) *In each question paper all questions are compulsory.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions: [10]

- a) Find the unique solution of the initial value problem $y'' + 4y = 0$; $y(0) = 2$, $y'(0) = 4$. Use the fact that $\sin 2x$ and $\cos 2x$ are solutions of the differential equation.
- b) Show that $y = \frac{1}{x}$ is a solution of the differential equation $2x^2 \frac{d^2 y}{dx^2} + 3x \frac{dy}{dx} - y = 0$ on the interval $0 < x < \infty$.
- c) Use the Wronskian to show that $1, x, x^2$ are linearly independent.
- d) Determine the interval on which the equation $(x - 1) \frac{dy}{dx} + y = \sin x$ is normal.
- e) If $f(D) \equiv 2D^2 - 3D + 3$ and $g(D) \equiv 2D + 5$, then compute $2f(D) + 3g(D)$.
- f) Solve $(D + 2)^3 y = 0$.
- g) Find the particular integral of the differential equation $\frac{d^2 y}{dx^2} + 4 \frac{dy}{dx} - 12y = e^{3x}$.
- h) State Euler's equidimensional equation.
- i) Convert the differential equation $x^2 y'' + 2xy' - 6y = 0$ into a differential equation with constant coefficients.
- j) State Existence and uniqueness theorem for solutions of n^{th} order initial value problem.

P.T.O.

Q2) Attempt any two of the following: [10]

- a) Let $p(x)$ and $q(x)$ be continuous in the interval (α, β) and let $y_1(x)$ and $y_2(x)$ be two solutions of the differential equation $\frac{d^2 y}{dx^2} + p(x)\frac{dy}{dx} + q(x)y = 0$. Prove that Wronskian $W[y_1, y_2](x)$ is either identically zero or it is never zero on the interval $\alpha < x < \beta$.
- b) Let $y_1 = x^2$ be a solution of $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - 4y = 0$. Find another solution y_2 of the differential equation.
- c) Solve $\frac{d^2 y}{dx^2} + 5\frac{dy}{dx} + 6y = e^x + 5$.

Q3) Attempt any two of the following: [10]

- a) Prove that $\frac{1}{f(D)} e^{ax} \cdot v = e^{ax} \frac{1}{f(D+a)} v$ where v is a function of x .
- b) Solve $(D^2 + 5D + 4)y = e^x \sin x$.
- c) Obtain the particular integral of the equation $y'' - 2y' + y = \frac{e^x}{x}$ by using the method of variation of parameters. Given that e^x and xe^x are linearly independent solutions of the associated differential equation of the given equation.

Q4) Attempt any one of the following: [10]

- a) i) Explain the method of variation of parameters to solve the nonhomogeneous differential equation $\frac{d^2 y}{dx^2} + p_1(x)\frac{dy}{dx} + p_2(x)y = q(x)$.
- ii) Convert the differential equation $\frac{d^3 y}{dx^3} + \left(\frac{dy}{dx}\right)^2 + 3y = 1$ into a system of first order equations.
- b) i) Solve the differential equation $(D^2 + 3D + 2)y = 12x^2$ by using the method of undetermined coefficients.
- ii) Solve the equation $(D^2 - 4)y = 3x^2$.



P581**[3617] - 153****S.Y. B.Sc. (Sem. - I)****MATHEMATICS****MT - 214 : Numerical Analysis****(Old Course)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:-**

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculators is allowed.

Q1) Solve the following questions:**[10]**

- a) Show that the equation $2x^5 - 3x^3 + 6 = 0$ has at least two imaginary roots.
- b) For $f(x) = x^6 - 2x^2 + 3x - 4$, find first two Sturm's functions.
- c) Find the real root of $x^6 - x^4 - x^2 - 1 = 0$ which is near to 1.5 using Newton-Raphson method by taking one iteration.
- d) Find the function whose first difference is e^x .
- e) Prove with usual notations, $\nabla \equiv \Delta E^{-1}$
- f) Prepare a backward difference table for the following data

x	-1	0	1	2	3
y	-21	6	15	12	3

- g) State Simpson's $\frac{1^{rd}}{3}$ rule of numerical integration.

- h) Using trapezoidal rule, & evaluate $\int_{10}^{50} y dx$

x	10	20	30	40	50
y	4	7	10	15	16

- i) Solve $\frac{dy}{dx} = 1 + xy$ with $y(0) = 2$ for $x = 0.1$ by Euler's method. Take $h = 0.1$.
- j) Write down the normal equations for fitting a straight line $y = a + bx$ to the given data.

P.T.O.

Q2) Attempt any two of the following :

[10]

- a) State and prove the fundamental theorem of difference calculus.
- b) Find the number and position of the roots of the equation $f(x) = x^5 - x - 1 = 0$, using Sturm's theorem.
- c) Fit the curve $y = a + bx + cx^2$ to the data given below

x	0	1	2	3	4
y	1	0	3	10	21

Q3) Attempt any two of the following:

[10]

- a) State and prove Newton-Gregory's forward interpolation formula for numerical integration.
- b) Solve by Gauss-Seidal method $10x + y + z = 12$, $x + y + 5z = 7$, $2x + 10y + z = 13$
- c) Fit a polynomial to the data

x	0	1	3	4
y	-12	0	6	12

Find the value of y when $x = 2$

Q4) Attempt any one of the following:

[10]

- a)
 - i) Explain Picard's method of successive approximation.
 - ii) Find $y(1.2)$ by Euler's method. The given differential equation is

$$\frac{dy}{dx} = x + y, y(1) = 0.$$

- b)
 - i) Using Simpson's $\frac{1}{3}^{\text{rd}}$ and $\frac{3}{8}^{\text{th}}$ rules, evaluate $\int_{-3}^3 x^4 dx$.

- ii) Find the missing term :

x	0	1	2	3	4
y	1	3	9	-	81



Total No. of Questions : 4]

[Total No. of Pages : 2

P582

[3617]- 162

S.Y. B.Sc.

GEOLOGY

**GL - 211 : Mineralogy
(Sem.- I) (Old Course)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following in two or three lines :

[10]

- a) Define 'biaxial mineral'.
- b) State the different types of twins.
- c) What are 'Phantom crystals'?
- d) Give the crystal system of Ruby.
- e) What is meant by 'compensation'?
- f) Define 'Anisotropism'.
- g) What is meant by 'Birefringence'?
- h) Name two polymorphs of orthoclase.
- i) Define 'twin plane'.
- j) Give the lustre shown by Diamond.

Q2) Explain the following (any two) :

[10]

- a) Becke-line method for determining R.I. of mineral.
- b) Gypsum plate.
- c) Phyllosilicate structure with examples.

P.T.O.

Q3) Write notes on (any two) : **[10]**

- a) Laws of twinning.
- b) Phenomenon of interference colours.
- c) Paragenesis of clay minerals.

Q4) Describe the silicate structure, chemical composition, physical and optical properties and paragenesis of Felspar group of minerals. **[10]**

OR

Describe the silicate structure, chemical composition, physical and optical properties and paragenesis of Garnet group of minerals.



P585

[3617]- 165

S.Y. B.Sc.

STATISTICS

**ST - 212 : Continuous Probability Distributions - I
(Sem.- I) (Paper - II) (Old Course)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following :

[1 each]

a) Choose the correct alternative in each of the following :

i) If a random variable (r.v.) X has G(6,3) distribution then the distribution of $Y = 2X$ is :

- 1) G (2, 3)
- 2) G (12, 3)
- 3) G (3, 3)
- 4) $G\left(6, \frac{3}{2}\right)$

ii) If a r.v. X has N (μ, σ^2) then its m.g.f. is given by

- 1) $e^{\mu t + \sigma^2 t^2}$
- 2) $e^{\mu t + \frac{1}{2} \sigma^2 t^2}$
- 3) $e^{\mu t + \sigma t}$
- 4) $e^{\mu t - \frac{1}{2} \sigma^2 t^2}$

iii) For an exponential distribution with mean θ , coefficient of skewness (γ_1) is

- 1) 0
- 2) 2
- 3) 6
- 4) -2

P.T.O.

b) State whether each of the following statement is True or False :

[1 each]

- i) If X and Y are independent r.v.s. then $K_{X+Y}(t) = K_X(t) \cdot K_Y(t)$.
 - ii) An exponential distribution possesses the lack of memory property.
 - iii) For a normal distribution with parameters (μ, σ^2) $(Q_2 - Q_1) = (Q_3 - Q_2) = (0.67)\sigma$.
- c) State any two properties of distribution function of a continuous r.v. (c.r.v.). [1]
- d) The p.d.f. of a c.r.v. X is :
 $f(x) = kx^3$; $0 \leq x \leq 1, k > 0$.
 $= 0$; elsewhere
find the value of k. [1]
- e) Define the term probability density function (p.d.f.). [1]
- f) The c.g.f. of a r.v. X is $K_X(t) = 5t + 25t^2$. Identify the distribution of X. Also state the mean and variance of X. [1]

Q2) Attempt any two of the following :

[5 each]

a) Distribution function of a c.r.v. X is :

$$\begin{aligned} f(x) &= 0 & ; & \quad x < 0 \\ &= \frac{x^2}{2} & ; & \quad 0 \leq x < 1 \\ &= 2x - \frac{x^2}{2} - 1 & ; & \quad 1 \leq x < 2 \\ &= 1 & ; & \quad x \geq 2. \end{aligned}$$

- i) Obtain the p.d.f. of X.
 - ii) Find $P\left(\frac{1}{2} < X < \frac{3}{2}\right)$ and $P\left(\frac{1}{2} < X < \frac{3}{2} \mid X > 1\right)$
- b) If a c.r.v. (X, Y) has joint p.d.f.
 $f(x, y) = x + y$; $0 \leq x \leq 1, 0 \leq y \leq 1$
 $= 0$; elsewhere
then find
- i) $P(X \leq Y)$
 - ii) $P\left(Y \geq \frac{1}{2}\right)$
- c) If a r.v. X has B(n, p) distribution then show that the probability distribution of $Z = \frac{X - E(X)}{\sqrt{V(X)}}$ is N(0, 1) as $n \rightarrow \infty$.

Q3) Attempt any two of the following : **[5 each]**

- a) Find the m.g.f. of $G(\alpha, \lambda)$. Hence find its mean and variance.
- b) Obtain the distribution function of exponential distribution with mean θ . Also find its inter quartile range.
- c) The mean yield for one-acre plots is 662 kg. with a standard deviation 32 kg. Assuming that yield is normally distributed, how many plots in a batch of 1000 plots would you expect to have yield
 - i) over 700 kg.
 - ii) below 650 kg?

Q4) Attempt any one of the following :

- a) i) The joint p.d.f. of (X, Y) is **[5]**

$$f(x, y) = \frac{2}{a^2} \quad ; \quad 0 < x < y < a, a > 0$$

$$= 0 \quad ; \quad \text{elsewhere}$$

find $E[Y | X = x]$.

- ii) A c.r.v. X has p.d.f. as follows : **[5]**

$$f(x) = \frac{1}{2} \quad ; \quad -1 \leq x \leq 1$$

$$= 0 \quad ; \quad \text{elsewhere.}$$

find the distribution function and the density function of $Y = X^2$.

- b) i) The distribution of a c.r.v. X is $G(\alpha, \lambda)$. Find $E(\sqrt{X})$. Hence show that the mean deviation about the mean of a $N(\mu, \sigma^2)$ distribution

is $\frac{\sigma \cdot \sqrt{2}}{\sqrt{\pi}}$. **[6]**

- ii) X_1, X_2, \dots, X_n are independent normal variates with parameters (μ_i, σ_i^2) $i = 1, \dots, n$ respectively. Then show that $Y = \sum_{i=1}^n A_i X_i$

has a normal distribution with parameters $\left(\sum_{i=1}^n A_i \mu_i, \sum_{i=1}^n A_i^2 \sigma_i^2 \right)$, where A_i 's are constants. Hence obtain the distribution of

$\bar{X} = \frac{\sum_{i=1}^n X_i}{n}$. State your assumptions if any. **[4]**



Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617]- 169

S.Y. B.Sc.

MICROBIOLOGY

MB - 212 : Bacterial Genetics and Applied Microbiology

(Paper - II) (Old Course) (Sem.- I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following (All sub questions are compulsory) : **[10]**

- a) Draw the structure of adenine.
- b) Write the use of an impeller.
- c) Name any two nonsense codons.
- d) Define scale up of fermentation.
- e) What are frameshift mutations?
- f) Name any two intercalating agents.
- g) Define master culture.
- h) What is dual fermentation?
- i) Define turbidostat.
- j) What is a nucleotide?

Q2) Attempt any two of the following : **[10]**

- a) Describe Messelson and Stahl's experiment to prove semiconservative mode of DNA replication.
- b) Enlist various sources of contamination in fermentation and describe its consequences.
- c) Describe replica plate technique to prove spontaneous mutation.

P.T.O.

Q3) Attempt any two of the following : **[10]**

- a) Explain Airlift fermenter with suitable diagram.
- b) What is primary screening? How antibiotic producing organisms are screened?
- c) Explain in brief the process of translation in prokaryotes.

Q4) Attempt any one of the following : **[10]**

- a) Explain with suitable diagram 'Design of a typical fermenter'. Describe the role of antifoam agents in fermentation process.
- b) What are transition and transversion mutations? Explain the mutagenic action of 2 aminopurine and 5 bromourasil.



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[3617] - 174

S.Y. B.Sc.

ELECTRONIC SCIENCE

EL - 211 : Circuit Design : Principles & Applications - I

(Old Course) (Paper - I) (Sem. - I) (22211)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) All questions are compulsory :

- a) Define CMRR. **[1]**
- b) Define BW for the frequency response of an amplifier. **[1]**
- c) Define harmonic distortion. **[1]**
- d) What is the DC voltage for 20V P-P? **[1]**
- e) Explain heat sink in brief. **[2]**
- f) "The gain of amplifier reduces with negative feedback" comment. **[2]**
- g) OPAMP is used as inverting amplifier with $R_i = 2k\Omega$ & $R_f = 22k\Omega$. Find the output voltage if input voltage is 100 mV. **[2]**
- h) A negative feedback is applied to an amplifier, with open loop gain of 120. Find the gain of the amplifier if the feedback factor is 0.05. **[2]**

Q2) Attempt any two of the following :

- a) Compare performance characteristics between BJT amplifier & FET amplifier. **[4]**
- b) Draw the circuit diagram of OPAMP as differentiator. Sketch the output waveform when square waveform is applied at the input. **[4]**
- c) Draw the block diagram of **[4]**
 - i) Current shunt feedback.
 - ii) Voltage shunt feedback.

P.T.O.

Q3) Attempt any two of the following :

- a) Draw a single stage transistor amplifier & explain d.c loadline with suitable output characteristics. [4]
- b) Draw the block diagram of OPAMP & explain various blocks in brief. [4]
- c) Draw the circuit diagram of class-B push pull amplifier. Show that the efficiency is 78.5%. [4]

- Q4)**
- a) Draw the circuit diagram of a single stage class A transistor amplifier. Write the mathematical calculations to design amplifier. [6]
 - b) Draw the circuit diagram of instrumentation amplifier using three OPAMP and derive the expression for gain. [6]

OR

- a) Draw the circuit diagram for class AB push pull amplifier. [4]
- b) Design a single stage class A amplifier with $I_c = 10 \text{ mA}$, $V_{cc} = 10\text{V}$, & $h_{fe} = 250$. Assume $V_{BE} = 0.7\text{V}$. [4]
- c) Draw the circuit diagram of OPAMP in inverting mode. If $R_i = 2\text{k}\Omega$, $R_f = 30 \text{ k}\Omega$, $V_i = 20 \text{ mV}$ & $V_{cc} = \pm 15 \text{ V}$. Find the output voltage. [4]



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[3617] - 175

S.Y. B.Sc.

ELECTRONIC SCIENCE

EL - 212 : Communication Systems - I

(Old Course) (Paper - II) (Sem. - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.**
- 2) Draw the neat diagram wherever necessary.**
- 3) Figures to the right indicate full marks.**
- 4) Use of non programmable calculator is allowed.**

Q1) Attempt all of the following :

- a) Define the term noise in communication system. **[1]**
- b) Define signal to noise ratio. **[1]**
- c) What is need for modulation? **[1]**
- d) What is selectivity of radio receiver? **[1]**
- e) What will be the modulation index of amplitude modulated output, if maximum amplitude of carrier wave is 5 volt and minimum amplitude is 3 volt? **[2]**
- f) An AM radio broadcast station operates at frequency of 550 kHz. Find the local oscillator frequency and the image frequency. **[2]**
- g) “Diode is less noisy than transistor”, comment. **[2]**
- h) “Walky talky is a half duplex type communication”, comment. **[2]**

Q2) Attempt any two of the following :

- a) Write a short note on “Applications of electronic communication”. **[4]**
- b) What is amplitude modulation? Derive an expression for instantaneous voltage of modulated signal. **[4]**
- c) Draw simplified block diagram of TV transmitter and explain the function of scanning and synchronization. **[4]**

P.T.O.

Q3) Attempt any two of the following :

- a) State the principle of an antenna and list various types of antenna. [4]
- b) List various parameters deciding the qualities of television picture. Explain any one of it. [4]
- c) State the advantages and drawbacks of TRF receiver over crystal receiver. [4]

Q4) Attempt the following :

- a) With neat diagram explain composite video signal. [6]
- b) Explain the concept of TDM and FDM in communication system. Discuss its significance. [6]

OR

Attempt the following :

- a) The output voltage of AM transmitter is given by $300(1 + 0.4 \sin 6280t) \sin 3.14 \times 10^7 t$. This voltage is fed to a load of 500Ω resistance. Determine
 - i) carrier frequency.
 - ii) modulating frequency.
 - iii) carrier power.
 - iv) total power output. [4]
- b) A carrier wave with amplitude 10V and frequency 5 MHz is amplitude modulated to 70% level with a modulating frequency 1kHz. Write down the equation of above wave. Sketch the waveform in frequency domain. [4]
- c) In a superheterodyne receiver having no RF amplifier, the loaded Q of antenna coupling circuit is 90. If the IF is 455 kHz, calculate the image frequency and image frequency rejection at 950 kHz. [4]



Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617]- 179

S.Y. B.Sc.

ENVIRONMENTAL SCIENCE

Environment and Impact of Human Activities on Environment

(Paper - I) (Old Syllabus) (Sem.- I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following in 1-2 lines each :

[10]

- a) Define environment.
- b) Give the difference between Rotation and Revolution of earth.
- c) Define ocean currents.
- d) What are limiting factors? Give one example.
- e) What is mortality?
- f) What are gaseous cycles?
- g) What is predation?
- h) Define the term solstices.
- i) Give the date of chernobyl disaster.
- j) Enlist the seasons of India.

Q2) Write short notes on any two of the following each in 8-10 lines :

[10]

- a) Why should we be concerned about the environment.
- b) Write a note on Biosphere.
- c) Write a note on Hydrological cycle with diagram.

P.T.O.

Q3) Answer any two of the following each in 8-10 lines : **[10]**

- a) Write a note on ocean currents in Atlantic Ocean.
- b) What are the types and causes of migration.
- c) Write a note on Ecological Niche.

Q4) Answer any one of the following in 20-22 lines : **[10]**

- a) Describe different types of Biome in detail.
- b) What is population explosion? Give historical overview with causes.



Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617]- 180

S.Y. B.Sc.

ENVIRONMENTAL SCIENCE

**Effects of Changed Environment on Man and Management of
Environment**

(Paper - II) (Old Syllabus) (Sem.- I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following in 1-2 lines each :

[10]

- a) Define hazardous waste.
- b) Write the effects of lead toxicity (any two).
- c) What are bacterial toxins? Write any two effects on health?
- d) Define minamata syndrome.
- e) Define incineration.
- f) What are the effects (any two) of improper disposal of medical waste?
- g) Define migration.
- h) What is noise pollution?
- i) Define urbanization.
- j) Write any two differences between sewage and solid waste.

Q2) Write short notes on any two of the following each in 8-10 lines :

[10]

- a) Explain methods of agricultural waste disposal.
- b) Write a note on any one developmental project.
- c) Classify different types of wastes.

P.T.O.

Q3) Write any two of the following each in 8-10 lines : **[10]**

- a) Effects of developmental activities.
- b) Explain occupational diseases.
- c) Recycling and disposal of industrial waste.

Q4) Write any one of the following in 20-22 lines : **[10]**

- a) What are environmental stress factors and their effects on health?
- b) What are water borne diseases and their sources? Explain the control measures.



Total No. of Questions : 4]

[Total No. of Pages : 2

P592

[3617]- 191

S.Y. B.Sc. (Vocational)

COMPUTER MAINTENANCE

Microprocessor Interfacing and Computer Hardware

(Paper - I) (Sem.- I) (Old Course)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) a) Attempt the following : **[4 × 1 = 4]**

State True or False only :

- i) Pentium was the first microprocessor to be introduced by intel.
- ii) •Model, •Data, END are called the directives in assembly language programme.
- iii) Pressing the power switch is an example of hardware interrupt to the system.
- iv) INT 21H is called the BIOS interrupt.

b) Attempt the following : **[4 × 2 = 8]**

- i) Differentiate between minimum and maximum mode.
- ii) What are the applications of interrupts?
- iii) What is a macro?
- iv) Explain the concept of refreshing of DRAM's?

Q2) Attempt any two of the following : **[2 × 4 = 8]**

- a) What are DOS and BIOS interrupts? Using BIOS interrupt, write a programme to clear the screen.
- b) Explain the operation of 8086 system in maximum mode.
- c) Explain the concept of DMA transfer.

Q3) Attempt any two of the following : **[2 × 4 = 8]**

- a) With block diagram explain structure and operation of a microcomputer.

P.T.O.

- b) Discuss the instructions set of 8086 microprocessor with suitable examples.
- c) With proper timing diagram, explain the read and write cycle of 8086 system.

Q4) Attempt any two of the following : **[2 × 6 = 12]**

- a) Discuss the internal architecture of 8086 microprocessor with block diagram.
- b) Write the assembly language programme to read 10 characters one by one from the key-board and display the same on the screen of monitor.
- c) Explain 8259 priority interrupt controller with suitable diagram.



Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617]- 198

S.Y. B.Sc. (Vocational)

COMPUTER MAINTENANCE

**Paper - II : Trouble Shooting of Computers
(Sem.- I) (Paper Code : 28721) (Old Course)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) a) Attempt any four : **[4 × 1 = 4]**

State whether True or False :

- i) 80586 processors were given the trademark name as “Pentium”.
- ii) IDE is the interface standard used for display adapters.
- iii) Cyrix and AMD processors are non-Intel microprocessors.
- iv) EISA bus has higher bandwidth than PCI bus.
- v) Line conditioners are used to control the data from memory to peripheral devices.

b) Attempt the following : **[2 × 2 = 4]**

- i) What is the maximum addressable memory of a bus architecture which uses 10 address lines?
- ii) What is the rate of data transfer achieved by a bus using 16-bit data bus and operating at 5 MHz with 8-bits being transferred in one cycle.

c) Comment on any two of the following : **[2 × 2 = 4]**

- i) Earthing is necessary to save the computer system.
- ii) Green PC saves 99% power in sleep/suspended mode.
- iii) SMPS supplies the most regulated and efficient power than any other power supply.

Q2) Attempt any two of the following : **[2 × 4 = 8]**

- a) What is an expansion bus? Describe PCI bus architecture.
- b) Explain the main features and specifications of PC-XT and PC-AT buses.
- c) Describe the architecture and significance of MCA and PCMCIA buses.

P.T.O.

Q3) Attempt any two of the following : **[2 × 4 = 8]**

- a) Explain BIOS and its significance in proper functioning of hardware devices.
- b) What are peripheral/system controllers? Explain their importance and functions in brief.
- c) What are chipsets? Explain their importance and functions in brief.

Q4) Attempt any two of the following : **[2 × 6 = 12]**

- a) List different display adapters you know. Explain the function of a display adapter. Describe the importance features of VGA.
- b) Draw and explain the block diagram of a ON-LINE UPS.
- c) List different power protection systems you know. Explain any one in details.



P639**[3617]-103****S.Y. B.Sc.****PHYSICS**

PH - 211 : Mathematical Physics
(Paper - I) (New) (Semester - I) (21211)

Time : 2 Hours]**[Max. Marks : 40****Instructions to the candidates:**

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of calculators and log tables is allowed.
- 4) Neat diagrams must be drawn wherever necessary.

Q1) Attempt all of the following :a) Define the terms Linearity and Homogeneity. [1]b) If $x + iy = \frac{1+2i}{1-3i}$, determine x and y . [1]

c) Find the work done in moving a object along a vector $\vec{r} = 2\vec{i} + 3\vec{j} - 4\vec{k}$
 if applied force is $\vec{F} = (6\vec{i} + 2\vec{j} + 3\vec{k})$ [1]

d) If $\phi = x^2y + y^2z + z^2x$ find $\vec{\nabla}\phi$ at point $(1, 3, -2)$. [1]e) Express the complex number $z = \frac{1+\sqrt{3}i}{2}$ in polar form. [1]f) Define concurrent vectors. [1]g) What is circulation of vector field. [1]h) If $|\vec{A}| = |\vec{B}|$ then prove that $|\vec{A}| + |\vec{B}|$ is perpendicular to $|\vec{A} - \vec{B}|$. [1]i) Assuming the expressions in exponential form for $\cos\theta$ and $\sin\theta$, then prove that $\sin(\pi/2 + \theta) = \cos\theta$. [1]**P.T.O.**

- j) Prove that vectors $\vec{A} = \vec{i} + 3\vec{j} + \vec{k}$ and $\vec{B} = 2\vec{i} + 6\vec{j} + 2\vec{k}$ are parallel to each other. [1]

Q2) Attempt any two of the following :

- a) Given that $x(u) = 1 + au$ and $y(u) = bu^3$, find the rate of change of $f(x, y) = xe^{-y}$ w.r.to 'u'. [5]
- b) Show that $x = 0$ is a regular singular point of the differential equation.
 $x^2y'' - x(2 - x)y' + (2 + x^2)y = 0$. [5]
- c) Show that the vector field represented by
 $\vec{F} = (z^2 + 2x + 3y)\vec{i} + (3x + 2y + z)\vec{j} + (y + 2zx)\vec{k}$ is irrotational but not solenoidal. [5]

Q3) Attempt any two of the following :

- a) The resistance 'R' of a uniform wire of length 'l' is given by $R = \frac{\sigma l}{\pi r^2}$ where σ is the specific resistance. If errors in the measurement of length and radius are 2% and 3% respectively, find the maximum possible percentage error in the resistance. [5]
- b) Interpret the equation geometrically [5]
 $|z - 3| = \sqrt{2}|z - 4|$ where $z = x + iy$.
- c) If $\vec{a} + \vec{b} + \vec{c} = 0$, then prove that $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$. [5]

Q4) A) Attempt 'a' or 'b'.

- a) i) Explain how will you determine the point $x = 0$ is an irregular singular point of the given linear, second order, homogeneous differential equation. [4]
- ii) Find a unit vector normal to the surface $x^2 + 3y^2 + 2z^2 = 6$ at point (2, 0, 1). [4]
- b) i) What is an Argand diagram? Explain multiplication of two complex numbers by using an Argand diagram. [4]
- ii) If $z = x^2y - 3y$, find dz . Given $x = 4$, $y = 3$, $dx = -0.01$ and $dy = 0.02$. [4]

B) Attempt any one of the following :

a) Determine the value of product

[2]

$$\cos\left(\frac{3\pi}{7} + i\sin\frac{3\pi}{7}\right)\left(\cos\frac{2\pi}{7} + i\sin\frac{2\pi}{7}\right)^2.$$

b) Obtain unit vectors \vec{e}_r and \vec{e}_θ in plane polar coordinate system.[2]



P640**[3617]-104****S.Y. B.Sc.****PHYSICS****PH - 212 : Electronics****(Paper - II) (New) (Semester - I)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:**

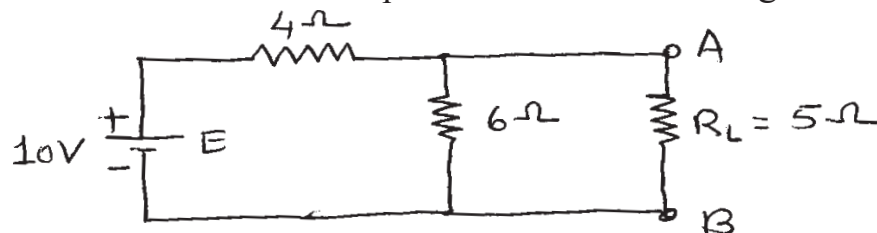
- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of calculators and log-tables are allowed.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Symbols have their usual meanings.

Q1) Attempt all of the following :

- a) Define temperature coefficient. [1]
- b) A coil has a resistance of $20\ \Omega$ and inductance of 100 mH. It is connected across a 200V, 50 Hz a.c. supply. Find impedance of circuit. [1]
- c) State maximum power transfer theorem. [1]
- d) Differentiate between constant-voltage source and constant-current source. [1]
- e) Find the values of β if i) $\alpha = 0.9$ and $\alpha = 0.99$ [1]
- f) Define CMRR. [1]
- g) What is regulated power supply. [1]
- h) What is input impedance of an Op-Amp? [1]
- i) Convert $(49)_{10}$ to binary number. [1]
- j) Give the truth table of NAND gate. [1]

Q2) Attempt any two of the following :

- a) State Norton's theorem. Explain how to Nortonize a given circuit. [5]

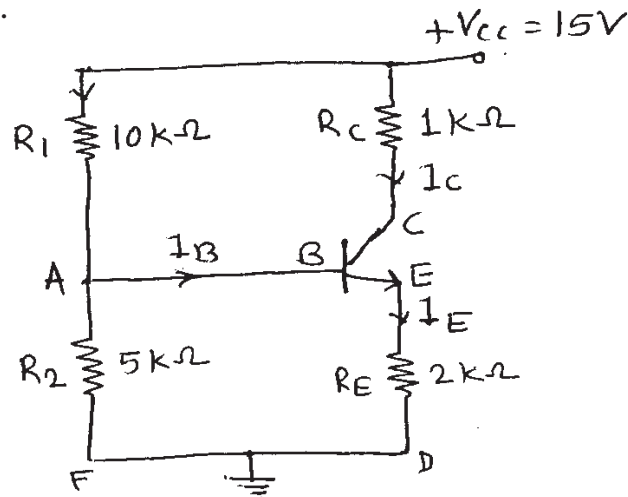
**P.T.O.**

b) What is transistor? Explain voltage divider bias method. [5]

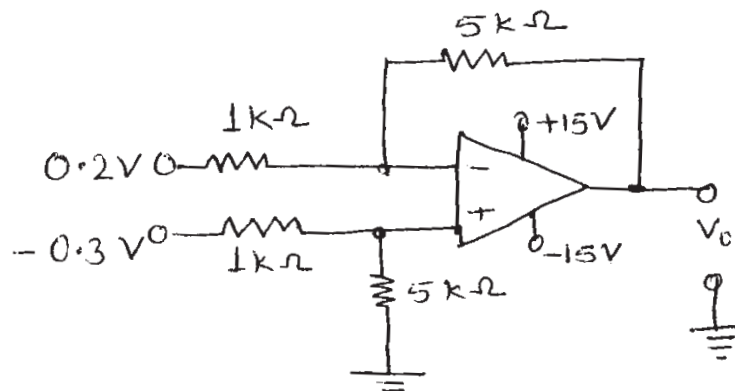
c) What is oscillator? Explain phase-shift oscillator using IC741. [5]

Q3) Attempt any two of the following :

a) Determine emitter current in the following voltage divider bias circuit. ($V_{BE} = 0.7 \text{ V}$). [5]

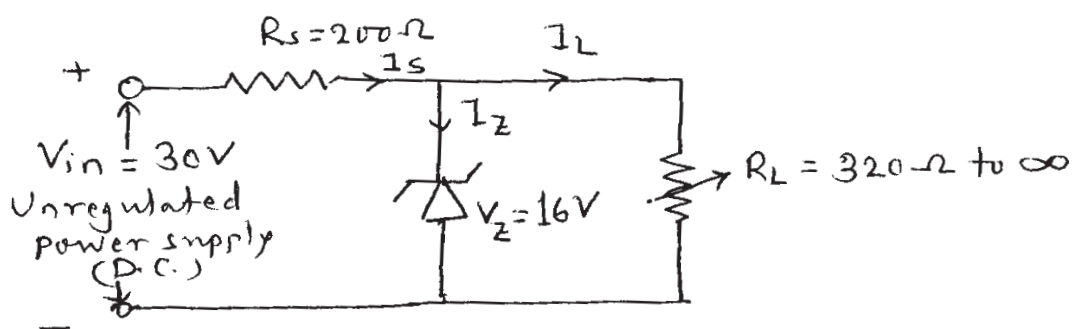


b) What will be the outputs for the following ckt? [5]



c) For the following zener regulator, calculate [5]

- current through the series resistance,
- minimum and maximum load current, and
- minimum and maximum zener current.



Q4) a) Attempt (i) or (ii) of the following :

i) 1) Describe working of a transistor as an amplifier. [4]

2) Explain working of an op-Amp as a non-inverting amplifier. [4]

ii) 1) Simplify using De-Morgan's theorems : [4]

I) $\overline{(\overline{A+B}) + \overline{C}}$ and

II) $\overline{\overline{AB} + \overline{A} + \overline{AB}}$

2) What is a logic gate? What are different types of basic gates?
Explain with truth tables. [4]

b) Attempt any one of the following :

i) What is transformer? List different losses of transformer. [2]

ii) State and explain Kirchhoff's current law. [2]



P640

[3617]-104

S.Y. B.Sc.

PHYSICS

PH - 212 : Instrumentation

(Paper - II) (New Course) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculators and log-tables are allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of the following :

- a) What is a transducer? Give it's example. **[1]**
- b) The dead zone in certain thermometer is 0.125 percent of span. The calibration is 400°C to 1200°C what temperature change might occur before it is detected? **[1]**
- c) What is MRI? **[1]**
- d) Explain the working principle of variable inductance transformer. **[1]**
- e) What do you mean by reproducibility of an instrument? **[1]**
- f) Define the relative permeability of a magnetic material. **[1]**
- g) Define first order system. **[1]**
- h) What do you mean by electromechanical transducer? **[1]**
- i) What is Paramagnetic substance? **[1]**
- j) What is meant by turbulent flow? **[1]**

Q2) Attempt any two of the following :

- a) Explain load cell with suitable diagram. **[5]**
- b) Explain the working of sound level meter with block diagram. **[5]**
- c) With neat block diagram explain the basic functional elements of typical measurement system. **[5]**

Q3) Attempt any two of the following :

- a) The diameter of the throat of a venturimeter is 6 cm. When it is inserted in a horizontal pipe line of diameter 10 cm, the pressure difference between the pipe and the throat equals to 8 cm of water. Calculate the rate flow. [5]
- b) When input voltage of an instrument changes from 15V to 20V, the corresponding output voltage changes from 70V to 90V. What will be the sensitivity of the instrument? [5]
- c) A magnet weighs 75 gm and it's magnetic moment is $2 \times 10^{-4} \text{ Am}^2$. If the density of the material of the magnet is $7.5 \times 10^3 \text{ kg m}^{-3}$. Calculate the intensity of magnetisation. [5]

Q4) a) Attempt (i) or (ii) of the following.

- i)
 - 1) State the principle and working of ultrasonic flow meter. [4]
 - 2) Write short note on errors in measurement. [4]
 - ii)
 - 1) Explain the working of LVDT with neat diagram. [4]
 - 2) Explain the principle and use of Ringelmann chart for smoke density measurement. [4]
- b) Attempt any one of the following :
- i) What do you mean by drift in the measurement. [2]
 - ii) Water flowing in a horizontal pipe has a speed 20 cm/s at one end point and 15 cm/s at another point. Determine the pressure drop between two points. [2]



P641

[3617]-115

S.Y. B.Sc.

GEOGRAPHY

**Gg - 211 : Fundamentals of Geography of Resources
(Paper - I) (New Pattern - 2008) (Semester - I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams and sketches wherever necessary.*
- 4) Use of map stencil is allowed.*

Q1) Answer the following questions in two or three sentences each : **[10]**

- a) Define a resource.
- b) Mention any two examples of non-renewable resources.
- c) State two components of natural resources.
- d) Mention any two direct uses of forests.
- e) Give two names of sources of water.
- f) State any two characteristics of rain water.
- g) State any two methods of conservation of land resources.
- h) Give two examples of abiotic resources.
- i) Define biotic resources.
- j) Give the types of wells.

Q2) Write short notes on any two of the following : **[10]**

- a) Environmental significance of forests.
- b) Water as a resource.
- c) Classification of resources.

P.T.O.

Q3) Attempt any two of the following : **[10]**

- a) Explain the importance of the study of resources.
- b) Explain what are renewable resources.
- c) Describe the effects of deforestation.

Q4) Describe the various uses of land resources. **[10]**

OR

Classify the resources and give importance of biotic resources.



P642

[3617]-116

S.Y. B.Sc.

GEOGRAPHY

**Gg - 212 : Introduction to Hydrology
(Paper - II) (New Pattern - 2008) (Semester - I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of Map stencil is allowed.*

Q1) Answer the following questions in two or three sentences each : **[10]**

- a) Define Hydrology.
- b) What do you mean by hydrological budget?
- c) What are units of hydrological measurement?
- d) What is water vapour?
- e) What is snowfall?
- f) What is probable maximum precipitation?
- g) What is interception?
- h) What is palaeohydrology.
- i) What is point precipitation?
- j) What is surface runoff?

Q2) Write short note on any two of the following : **[10]**

- a) Measurement of rainfall.
- b) Application of hydrology.
- c) Gross and net precipitation.

P.T.O.

Q3) Answer any two of the following : **[10]**

- a) Describe the distribution of rainfall in India.
- b) What are sources of hydrological data?
- c) What is areal precipitation?

Q4) Describe hydrological cycle with suitable diagram. **[10]**

OR

What is precipitation? Explain the various types of precipitation.



P643

[3617]-130

S.Y. B.Sc.

OPTIONAL ENGLISH

Enriching Oral and Written Communication in English

(New Course) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt any two of the following : **[10]**

- a) Explain the term ‘upward communication’ and state how effectively you would use it as a laboratory attendant to give feedback to the Head of the Department, Office Superintendent and the Principal.
- b) Imagine that you are going to deliver a talk on ‘Social Service’ to the students of your college in an NSS programme. Explain how effectively you would make use of body language in support of your speech.
- c) You have been appointed as an instructor of an NCC troop. You are asked to give a lot of instructions to the cadets. List important features of effective communication that you would take care of as the sender of the message.

Q2) Attempt any five of the following : **[10]**

- a) Find out meanings of the underlined words in the given sentences from the list given in the brackets.
 - i) She looks cool in her new dress.
 - ii) They painted the room in cool colour.
(indifferent, attractive, silent)
- b) Use any one of the following words in separate sentences as noun and verb in order to bring out meaning : drop, nurse.

P.T.O.

c) Match the synonymous words.

A	B
repair	slim
sorrow	mend
slender	remember
recall	grief

d) Choose the correct alternatives and fill in the gaps.

- i) We, in India must follow the ----- of religious tolerance.
(principal, principle)
- ii) Since his judgements are proper, he is a ----- person. (sensitive, sensible).

e) Make two words each with the help of the following suffixes.

-less, -ment

f) Choose the right collocation. (any two)

- i) Next month I am (giving/taking) an exam.
- ii) One must (solve/overcome) ones difficulties.
- iii) I had a (quick/fast) meal in the morning as I had to attend a meeting.

Q3) Attempt any five of the following :

[10]

a) Find out the correct spellings. (any two)

- i) pursue, persue, perusue
- ii) bouquete, boucuete, bouquet
- iii) thesaurus, thesarus, thessaurus

b) Identify the part of speech of the underlined words. (any two)

- i) Whenever I come across a new word, I refer to dictionary.
- ii) Keep the lights on, please.
- iii) Flying planes can be dangerous.

c) Match the meanings of phrasal verbs in A with their meanings in B.

A: bring back, bring up

B: to move, to return, to take care

d) Provide a lexical set of four words each for the following :

education, holiday

e) Provide antonyms for the following words.

arrival, superior

- f) Rearrange the jumbled letters to form meaningful words with the help of hints given. (any two)
talaf (dealing with death), strnaipeed (one who walks), tpmoinner (important)

Q4) Attempt any two of the following : **[10]**

- a) Answer any five of the following.
- i) Say whether the initial sound in the following words is a vowel, a consonant or a diphthong?
umbrella, scheme
 - ii) Transcribe phonemically any one of the following words.
take, quest
 - iii) Mark stress in the words 'angry' and 'address'.
 - iv) Underline the stressed words in the following sentence.
The hunter killed the tiger
 - v) Say whether the following sentences will be said with a falling or a rising tone. (any one)
Where does he live?
Close the door.
 - vi) Underline the weak forms in the following sentence.
He is a good player.
- b) Write down short responses in the form of an utterance or two according to the situations given below. (any five).
- i) Introduce your teacher to you father.
 - ii) Someone allowed you to use his/her mobile. Thank him/her.
 - iii) Your younger brother is nervous before leaving for examination hall. Encourage him.
 - iv) You heard sad new of the defeat of Indian cricket team. Respond.
 - v) Ask the library attendant for help.
 - vi) Someone suggested you to purchase non polluting bike. Respond to his/her suggestion.
- c) You want to travel to Chennai by train. You go to the travel agent and ask information about the train, its time, fare and reservation-cum-ticket. The agent gives you the necessary information. Write this in the form of a short dialogue of about fifteen utterances.



P645

[3617]- 134

S.Y. B.Sc.

INDUSTRIAL CHEMISTRY (Vocational Course)

VOC - 211 : Utilities and Unit Operations and Process Instrumentation

(Sem.- I) (Paper - I) (Old & New Course)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following questions : **[16]**

- a) What is the continuity principle?
- b) What are agitated batch driers?
- c) What is meant by azeotropic distillation?
- d) Convert 6° C into reamur scale of temperature.
- e) What is the SI unit of density? The density of coke at 1000° C is 1.5g cm⁻³ convert it into SI units.
- f) How is evaporation useful in industries?
- g) Define crystallization with example.
- h) Explain the term “equilibrium moisture content of materials”.

Q2) Attempt any two of the following : **[8]**

- a) Describe the construction of inclined manometer.
- b) Write a note on industrial uses of steam.
- c) Describe the working of capacitance level indicator.

Q3) Attempt any two of the following : **[8]**

- a) Sketch and explain the Mcleod Gauge.
- b) Explain the principle and working of hydrometer.
- c) Write a note on fluidized bed driers.

Q4) Explain the principle and working of resistance thermometer.

OR

Discuss the principle and uses of fractional distillation. **[8]**



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S.Y. B.Sc.

SEED TECHNOLOGY

Hybrid Seed Production

(Sem.- I) (Paper - IV) (New) (Vocational Course)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following :

[10 × 1 = 10]

- a) What is meant by inbreeding depression?
- b) Enlist the types of apomixis.
- c) Define cytoplasmic-genetic male sterility.
- d) What is homomorphic self incompatibility?
- e) Give any two uses gametocides.
- f) What are pollen shedders?
- g) Define planting ratio.
- h) Give any two types of pollination methods employed in hybrid seed production.
- i) Mention any two uses of genetic male sterility in hybrid seed production.
- j) Give the requirements for isolation distance in Bajra.

Q2) Attempt any two of the following :

[2 × 5 = 10]

- a) Give an account of commercial utilization of heterosis.
- b) What is emasculation? Explain any two methods of emasculation.
- c) Define sowing. Describe any two methods of sowing.

Q3) Write short notes on any two of the following :

[2 × 5 = 10]

- a) Cytoplasmic male sterility.
- b) Pollen storage.
- c) Roughing.

Q4) Explain in detail stepwise procedure for hybrid seed production in Maize or Cotton.

[10]



Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617]- 140

S.Y. B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

**VOC - IND - MIC - 211 : Bioreactors - Design and Operation
(Sem.- I) (Paper - I) (New Course) (2008 Pattern)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Use of scientific calculator is allowed.*

Q1) Answer each sub-question in one or two lines ; Fill in the blanks; State whether the statement is true or false : **[10]**

- a) State whether the following statement is TRUE or FALSE.
“Depth filters are also called as absolute filters”.
- b) State whether the following statement is TRUE or FALSE.
“Hollow Fibre Reactor are generally used for mold mycelia cells”.
- c) The pH sensor is based on ——— (principle of measurement).
- d) When the H/D ratio of a fermenter vessel is more than 2.0, and the fluid is viscous, the number of impeller sets needed ideally is ———.
- e) Name any two antifoam agents.
- f) How are amino acid solutions sterilized for use fermentation media?
- g) List any two factors that affect the design of a fermenter.
- h) Name any two types of valves used in fermenter assemblies.
- i) State the consequences of contamination of fermentation medium during the process.
- j) Define ‘on-line’ monitoring of a process variable.

Q2) Attempt any two of the following : **[10]**

- a) Draw a diagram to illustrate the construction of fermenter used for solid substrate fermentation. Enlist the products which are manufactured using solid-substrate fermentation.
- b) Explain the principle of operation of a sensor used for monitoring DO during a fermentation process. State the importance of monitoring DO.
- c) Draw and explain the working of the sampling port in a fermenter.

P.T.O.

Q3) Answer any two of the following : **[10]**

- a) What is 'exit gas' in a fermentation process. Justify why exit gas analysis is important.
- b) Draw a diagram to show the equipment used for aeration of a fermentation broth. Describe how the microbial load is reduced during this process.
- c) Compare the continuous and batch processes. Draw the profiles for both types of processes.

Q4) Answer any one of the following : **[10]**

- a) Describe the construction, working and limitations of a Hollow Fibre Reactor.
- b) Enlist the methods of immobilization of cells and enzymes. Describe the process of covalent linking in detail. State applications where covalent linking is used.



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[3617]- 141

S.Y. B.Sc.

INDUSTRIAL CHEMISTRY (Vocational Course)

VOC - 212 : Inorganic Process Industries

(Sem.- I) (Paper - II)

(Old & New Course) (25621)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following questions : **[16]**

- a) Define corrosion. Give an example.
- b) What are whiskers?
- c) How is PVC prepared? Give uses of it.
- d) Define glazing. Give the uses of it.
- e) What is meant by % NVM?
- f) What are particle reinforced composites?
- g) List the finishing operations given to molten glass.
- h) Define cullet. Give its use.

Q2) Attempt any two of the following : **[8]**

- a) Define white wares. How are they classified?
- b) Give the composition of two types of copper alloys and their uses.
- c) What is fiber glass? Give its uses.

Q3) Write short notes on any two of the following : **[8]**

- a) α and β alloys.
- b) Ball mills and tube mills.
- c) Annealing of glass.

Q4) Describe briefly the manufacture of cement by wet process.

OR

What is corrosion? Discuss the mechanism of electrochemical corrosion. **[8]**



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[3617] - 146

S.Y. B.Sc.

SEED TECHNOLOGY

Seed Testing

(New) (Sem. - I) (Paper - V) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.***
- 2) Figures to the right indicate full marks.***
- 3) Draw neat and labelled diagram wherever necessary.***

Q1) Attempt the following :

[10 × 1 = 10]

- a) Define seed sampling.
- b) Give any one objective of central seed testing laboratory.
- c) Enlist different types of seed divider's.
- d) What are submitted samples?
- e) Define other crop seed component.
- f) Enlist types of seed samples.
- g) Define germination.
- h) What are abnormal seedlings.
- i) Enlist equipments used for moisture testing.
- j) What are guard samples.

Q2) Attempt any two of the following :

[2 × 5 = 10]

- a) Give organization of state seed testing laboratory.
- b) Explain general principles of seed sampling.
- c) Describe the procedure for registration of seed sample.

P.T.O.

Q3) Write notes on any two of the following : **[2 × 5 = 10]**

- a) Maintenance of equipments used in seed testing laboratory.
- b) Mixing and dividing samples.
- c) Principles of seed vigour testing.

Q4) What is physical purity? Give purity components and procedure for the analysis of physical purity. **[10]**

OR

What is germination? Describe general principles and requirements for germination testing.



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[3617] - 147

S.Y. B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

VOC-IND-MIC - 212 : Screening & Process Optimization

(New) (2008 Course) (Paper - II) (Sem. - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.***
- 2) Figures to the right indicate full marks.***
- 3) All questions carry equal marks.***
- 4) Draw neat labelled diagrams wherever necessary.***
- 5) Use of scientific calculators is allowed.***

Q1) Answer each sub-question in one or two lines; Fill in the blanks; State whether the statement is true or false : **[10]**

- a) State whether the following statement is TRUE or FALSE Antibiotics are generally produced during logarithmic phase of growth of bacteria.
- b) State whether the following statement is TRUE or FALSE Vegetable oils play dual role in fermentation processes.
- c) Fill in the blank.
_____ is an analogue of lysine.
- d) Fill in the blank.
The relationship between Del Factor, temperature and time is given by the equation _____.
- e) Fill in the blank.
Antibiotic production only begins to increase in the culture broth after most of the _____ source has been consumed.
- f) What are antifoams?
- g) What is Simpson's Index?
- h) What does the term "Scale-up" mean in fermentation industry?
- i) Define "Decimal Reduction Time".
- j) Define "Microbial Diversity".

P.T.O.

Q2) Write short notes on any two of the following : **[10]**

- a) Primary Screening.
- b) Raw materials used as sources of carbon in fermentation media.
- c) Lyophilization.

Q3) Answer any two of the following : **[10]**

- a) Explain the objectives of targeted screening procedures.
- b) Describe the process of inoculum build-up.
- c) Describe the different levels of fermentation and their role in fermentation process development.

Q4) Answer any one of the following : **[10]**

- a) Describe different methods of measurement of microbial diversity.
- b) Describe the procedure for isolating mutants that do not recognize the presence of inhibitors and repressors.



P651**[3617] - 154****S.Y. B.Sc.****PHYSICS****PH - 211 : Mathematical Physics****(Old) (21211) (Paper - I) (Sem. - I)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:**

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculators and log-tables is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of the following :

- a) If $a + ib = \frac{1+2i}{1-i}$ then find 'a' and 'b'. [1]
- b) State order and degree of the differential equation $\frac{d^5 y}{dx^5} + \sqrt{\frac{d^3 y}{dx^3}} + y = 0$. [1]
- c) Show that $dF = (5x^2 + 3y)dx + (3x - 5y^2)dy$ is exact differential. [1]
- d) When the point $X = X_0$ is said to be an ordinary point of the given differential equation. [1]
- e) If $F = e^{xy}$, then find F_x and F_y . [1]
- f) Determine the value of P so that $\vec{A} = 3\vec{i} + P\vec{j} + \vec{k}$ and $\vec{B} = 3\vec{i} - 2\vec{j} - 3\vec{k}$ are perpendicular. [1]
- g) What are flow charts? Give its two advantages. [1]
- h) If $\phi = x^3y + yz^2$, then find $\nabla\phi$ at (1, 1, 3). [1]
- i) Show that $\sin h\theta = -i \sin(i\theta)$ [1]
- j) What do you mean by explicit function? [1]

P.T.O.

Q2) Attempt any two of the following :

a) Obtain the quadratic equation in z , if its roots are $(z + \sqrt{3}i)$ and $(z - \sqrt{3}i)$. [5]

b) The equation of state for one mole of perfect gas is $PV = RT$.

Show that $T \left(\frac{\partial P}{\partial T} \right)_V \left(\frac{\partial V}{\partial T} \right)_P = R$. [5]

c) Show that $x = 0$ is regular singular point of Bessel differential equation $x^2 y'' + xy' + (x^2 - n^2)y = 0$. [5]

Q3) Attempt any two of the following :

a) The vectors $\vec{A} = 2\vec{i} - \vec{j} + \vec{k}$, $\vec{B} = 3\vec{i} + P\vec{j} + 5\vec{k}$ and $\vec{C} = \vec{i} + 2\vec{j} - 3\vec{k}$ are coplanar. Determine the value of constant P . [5]

b) If $F = xe^{-y}$, where $x = \cosht$ and $y = cost$ using chain rule, Find $\frac{dF}{dt}$. [5]

c) What is an Argand diagram? Explain division of two complex numbers by using an Argand diagram. [5]

Q4) Attempt any one of the following :

a) i) Write an algorithm and draw flow chart to find the largest of three numbers. [5]

ii) Determine the directional derivative of $\phi = 4xz - 3xy^2 + 2y^2x$ at $(1, -1, 2)$ in the direction of $\vec{i} - \vec{j} + \vec{k}$. [5]

b) i) Determine the work done in moving a particle in a force field given by $\vec{F} = 7xy\vec{i} + 2z\vec{j} + x\vec{k}$ along the curves $x = 2t^2$, $y = t$ and $z = t^2 - 3t$ from $t = 0$ to $t = 1$. [5]

ii) What is scalar triple product? Show that the scalar triple product represents the volume of parallelopiped. [5]



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[3617] - 155

S.Y. B.Sc.

PHYSICS

**PH - 212 : Electricity and Magnetism
(Old Course) (Paper - II) (Sem. - I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.**
- 2) Figures to the right indicate full marks.**
- 3) Use of calculators and log-tables are allowed.**
- 4) Neat diagrams must be drawn wherever necessary.**
- 5) Symbols have their usual meanings.**

Q1) Attempt all of the following :

- a) Define electric potential. **[1]**
- b) Define electric intensity. **[1]**
- c) State Coulombs law. **[1]**
- d) Define electric polarization vector (\vec{p}) . **[1]**
- e) Differentiate polar and non-polar dielectrics. **[1]**
- f) A fully charged $5\mu\text{F}$ capacitor is allowed to discharge through $10 \times 10^5 \Omega$ resistor. Find time constant of CR circuit. **[1]**
- g) Define current density. Give its unit. **[1]**
- h) State Joule's law in electricity. **[1]**
- i) Calculate the magnetic induction in air at a point 1m from a long straight wire carrying a current of 5 A. ($\mu_0 = 4\pi \times 10^{-7} \text{ Wb/A-m}$). **[1]**
- j) State Lenz's law in magnetostatics. **[1]**

Q2) Attempt any two of the following :

- a) State and prove Gauss's theorem in electrostatics. **[5]**
- b) Define \vec{B} , \vec{H} and \vec{M} . Obtain the relation between them. **[5]**
- c) What is transformer? Explain its working principle and obtain its turns ratio relationship. Lists the various losses in transformer. **[5]**

P.T.O.

Q3) Attempt any two of the following :

- a) An electric field having uniform electric intensity of 3×10^4 V/m in a medium of dielectric constant 3, is incident at an angle of 30° on the surface of another medium of dielectric constant 9. Find the magnitude and direction of the electric intensity in the other medium. [5]
- b) A solenoid of length 2m is wound uniformly with 10,000 turns of wire. It carries a current of 4 Amp. What is the value of [5]
 - i) Magnetic induction on the axis of the solenoid at the centre,
 - ii) Magnetic induction on the axis at an end.
- c) A condenser of $1 \mu\text{F}$ and a resistance of 50Ω are connected in series with an a.c. supply of 100V, 50 Hz. Find an expression for rms current and average power. Calculate the value of self-inductance to be added to the circuit to give maximum current. [5]

Q4) a) Attempt (i) or (ii) of the following :

- i) 1) Obtain the relation between three electric vectors \vec{D} , \vec{E} and \vec{P} . [4]
 - 2) Prove the equation of continuity, $\nabla \cdot \vec{J} + \frac{\partial \rho}{\partial t} = 0$. [4]
 - ii) 1) State and prove Biot-Savart's law. [4]
 - 2) Derive an expression for power dissipated in an AC circuit. [4]
- b) Attempt any one of the following :
- i) What is meant by electric dipole and dipole moment. [2]
 - ii) Define specific resistance and electrical conductivity. [2]



P653

[3617] - 166

S.Y. B.Sc.

GEOGRAPHY - I

Gg - 211 : Fundamentals of Agricultural Geography

(Old) (2005 Pattern) (Paper - I) (Sem. - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.***
- 2) Figures to the right indicate full marks.***
- 3) Draw the neat diagrams and sketches wherever necessary.***
- 4) Use of map stencil is allowed.***

Q1) Answer the following questions in about two or three sentences each : **[10]**

- a) Define Agricultural Geography.
- b) State recent approaches to agricultural studies.
- c) Write any two characteristics of intensive agriculture.
- d) State the importance of biofertilizers.
- e) What is specific zero?
- f) State any two methods of soil conservation.
- g) What do you understand by NPK?
- h) Define irrigation.
- i) What is fixed capital?
- j) What is soil degradation?

Q2) Write short notes on any two of the following :

[10]

- a) Significance of agriculture in Indian economy.
- b) Mixed farming.
- c) Formation of laterite soils.

P.T.O.

Q3) Attempt any two of the following :

[10]

- a) Differentiate between canal and tank irrigation.
- b) Explain the importance of transportation in agriculture.
- c) Give the meaning of soil pH and its importance.

Q4) Comment on 'Soil as a resource'.

[10]

OR

Explain the determinants of agriculture.



P746

[3617] - 105
S.Y. B.Sc. (Sem. - I)
CHEMISTRY
CH - 211 : Physical Chemistry
(21311) (Theory) (New)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of logarithmic table and calculator is allowed.*
- 4) Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following :

[10]

- a) Give the importance of the third law of thermodynamics.
- b) State Nernst distribution law.
- c) What do you mean by standard free energies of formation?
- d) Draw vapour pressure - temperature curve for solvent and solution.
- e) Define the term critical solution temperature.
- f) Write the relation between K_p and K_c .
- g) 0.3 M solutions of Urea and Glucose gave the same boiling point elevation. Why?
- h) What are conjugate solutions?
- i) State different forms of Clapeyron equation.
- j) Define the term freezing point.

Q2) a) Attempt any two of the following :

[6]

- i) State and explain the third law of thermodynamics and give its limitations.
- ii) State and explain Le-Chatelier-Braun principle.
- iii) What do you mean by abnormal molecular weights? Why are abnormal molecular weights observed?

P.T.O.

b) Solve any one of the following : [4]

- i) A solution of 12.5 gm of an unknown solute in 170 gm of water gave a boiling point elevation of 0.63°C calculate molecular weight of the solute.
($K_b = 0.52$)
- ii) Three moles of nitrogen and two moles of oxygen are mixed at constant temperature. Assuming that these gases do not react chemically, calculate the entropy of mixing
[$R = 8.314 \text{ J mole}^{-1} \text{ K}^{-1}$].

Q3) a) Attempt any two of the following : [6]

- i) State and explain Henry's law of ideal-dilute solution.
- ii) Derive an expression for the partition coefficient for the system in which the solute is in normal state in one phase and has associated molecules in the other phase.
- iii) Define a colligative property. Obtain the relation between i and α .

b) Solve any one of the following : [4]

- i) 84 gm of nitrogen is compressed reversibly and isothermally at 30°C from 20 atm to 180 atm. Calculate free energy change.
(At wt of N = 14, $R = 8.314 \text{ J mole}^{-1} \text{ K}^{-1}$)
- ii) The mixture of organic compound and water boils at 98°C at 760 mm of Hg. The vapour pressure of water at this temperature is 712 mm of Hg. Find the weight composition of the distillate.
(Given : Mol Wt of organic compound = 204).

Q4) a) Derive clausis - Clapeyron equation and give its applications. [6]

OR

Describe with the help of neat diagram Landsberger's method for determining the molecular weight of a given solute.

b) Attempt any one of the following : [4]

- i) Define the vapour pressure of a liquid and explain isoteniscope method to determine vapour pressure of liquid.
- ii) Define the following terms
 - 1) Molarity
 - 2) Normality
 - 3) Molality
 - 4) Mole fraction.



P747

[3617] - 106

S.Y. B.Sc.

CHEMISTRY

CH - 212 : Organic Chemistry

(21321) (Paper - II) (New Revised Syllabus) (Sem. - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following :

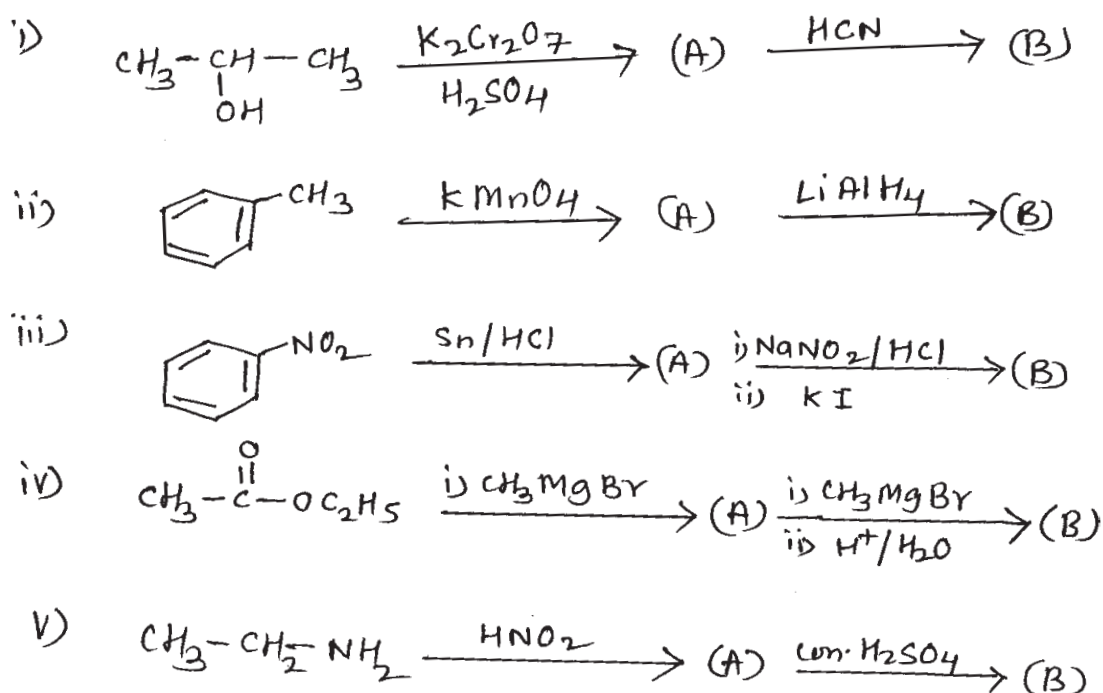
[10]

- a) Define threo isomer.
- b) How will you distinguish acetaldehyde and acetone using a chemical test?
- c) Give preparation of acetic acid using a grignard reagent.
- d) How will you prepare 1-propanamine?
- e) Give use of LiAlH_4 .
- f) Pyridine is stronger base than pyrrole, why?
- g) Give importance of biochemistry in Health.
- h) What is action of Tollen's reagent on Glucose.
- i) Give any two functions of lipids.
- j) Draw structure of Adenosine.

Q2) a) Assign the structures to (A) and (B) in the following reactions (any three)

[6]

P.T.O.



- b) How will you bring about the following conversions (any two) : [4]
- benzoic acid into aniline.
 - phenol into anisole.
 - methyl amine into ethyl amine.

Q3) Attempt any two of the following : [10]

- Give synthesis of pyridine from picoline. What is action of the following reagents on pyrrole?
 - CHCl_3/KOH
 - H_2/Ni
 - $\text{SO}_3/\text{Pyridine}$.
- What are polysaccharides? Give their classification. Add a note on amylose and amylopectin.
- Give structures of (1) oleic acid (2) palmitic acid. Discuss the functions of lipids.

Q4) a) Answer the following (any two) : [6]

- What are enzymes? Discuss the specificity of enzymes.
- How will you prepare acetophenone from benzene? Give action of the following on acetophenone.
 - NH_2-NH_2
 - HCN .

- iii) What are amines? How will you distinguish methyl amine and dimethyl amine using a chemical test.
- b) Draw Newmann projection for e-methyl and a-methyl cyclohexanes. Why e-methyl cyclohexane is more stable than a-methyl cyclohexane? **[4]**

OR

- b) What is meant by replication of DNA? Explain replication of DNA by using Watson-Crick model. **[4]**



P748

[3617] - 107

S.Y. B.Sc.

BOTANY

BO - 211 : Fundamentals of Plant Systematics and plant Ecology
(New Course) (Paper - I) (Sem. - I) (51411)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following :

[10]

- a) Define taxonomy.
- b) Give an example of artificial system of classification.
- c) Enlist two anatomical characters used in plant systematics.
- d) Give two limitations of Bentham and Hookers system.
- e) What is botanical nomenclature?
- f) Define plant ecology.
- g) What is homeostasis?
- h) Enlist two internal ecological adaptations of hydrophytes.
- i) Define succession.
- j) What is ecological pyramid?

Q2) Answer any two of the following :

[10]

- a) Discuss merits of Bentham and Hookers system of classification.
- b) Explain nudation and migration stages of succession.
- c) Describe the pyramid of number.

P.T.O.

Q3) Write short notes on any two of the following : **[10]**

- a) Effective and valid publication.
- b) Molecular systematics.
- c) Adaptive features in xerophytes.

Q4) Give distinguishing characters, floral formula and floral diagram of family Annonaceae and Liliaceae. **[10]**

OR

Define ecosystem. Explain the abiotic and biotic components of an ecosystem and add a note on their interrelationship.



P749

[3617] - 108

S.Y. B.Sc.

BOTANY

BO - 212 : Fundamentals of Plant Physiology

(New Course) (Paper - II) (Sem. - I) (51421)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following :

[10]

- a) Define plant physiology.
- b) Give any two physical properties of water.
- c) What is ascent of sap?
- d) Define molar solution.
- e) What are antitranspirants?
- f) Mention any two criteria for determining the essentiality of mineral elements.
- g) What is passive absorption of salts.
- h) Define vernalization.
- i) What are plant hormones.
- j) Define growth.

Q2) Answer any two of the following :

[10]

- a) What is osmosis? Explain the mechanism of osmosis.
- b) Give the role of water in plants.
- c) Explain physical force theories of ascent of sap.

P.T.O.

Q3) Write notes on any two of the following : **[10]**

- a) Role of nitrogen in plants.
- b) Practical applications of gibberellins.
- c) Short day plants.

Q4) What is transpiration? Describe the structure of stomata. Explain the mechanism of opening and closing of stomata. **[10]**

OR

What is active salt absorption? Explain theories of active salt absorption.



P750

[3617] - 109

S.Y. B.Sc.

ZOOLOGY

ZY - 211 : General Zoology and Biological Techniques - I

(New Course) (Paper - I) (Sem. - I) (2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following :

[10]

- a) Name any one organism showing amoeboid movement.
- b) What is dextral shell?
- c) Define the term developmental biology.
- d) Define alecithal egg.
- e) Enlist any two types of cleavages.
- f) What do you mean by In vitro Fertilization?
- g) What do you mean by centrifugation?
- h) State Beer's law.
- i) For what purpose oscillatory method is used?
- j) What is micrometry?

Q2) Write short notes on (any two) :

[10]

- a) Patterns of coelom in animals.
- b) Sterilization by dry heat.
- c) Thin layer chromatography.

P.T.O.

Q3) Attempt the following (any two) :

[10]

- a) Describe biting and chewing type of mouthparts.
- b) Explain useful protista.
- c) Sketch and label-Horizontal paper electrophoresis.

Q4) Describe in details the digestive system of starfish.

[10]

OR

What is gametogenesis? Describe the process of oogenesis in details.



P751

[3617] - 110

S.Y. B.Sc.

ZOOLOGY

ZY - 212 : Applied Zoology - I

(New Course) (Paper - II) (Sem. - I) (2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following :

[10]

- a) Define-Inland fisheries.
- b) Write the biological name of lemon butterfly.
- c) Write the meaning of gears.
- d) Write the biological name of rohu.
- e) Enlist names of any two non-insect pest.
- f) Mention habit and habitat of Catla Catla.
- g) Name any two biocontrol agents.
- h) Define-stomach poison.
- i) What is the use of ising glass.
- j) Define the term pheromone.

Q2) Write short notes on (any two) :

[10]

- a) Catamaran.
- b) Cultural measures of pest control.
- c) Rotary duster.

P.T.O.

Q3) Answer the following (any two) :

[10]

- a) Explain harvesting method for Bombay duck.
- b) Write in brief nature of damage and control measures of Chilo Zonellus.
- c) Explain fish meal and fish flour.

Q4) What is fish preservation? Describe any four fish preservation techniques. **[10]**

OR

Describe marks of identification, nature of damage and control measures of red cotton bug.



P752

[3617] - 119

S.Y. B.Sc.

PSYCHOLOGY

Psychology of Adjustment

(New Course) (Paper - I) (Sem. - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) Attempt all questions.***
- 2) Draw the figures and diagrams wherever necessary.***
- 3) Figures to the right indicate full marks.***

Q1) Answer in two or four sentences :

[16]

- a) What is psychology?
- b) Define marriage.
- c) Which are the risk factors of divorce?
- d) What is the endogamy?
- e) Explain the meaning of 'quid pro quo'.
- f) What is the importance of the medical model of abnormal behaviour.
- g) What is the full form of DSM and when published first edition?
- h) Explain the meaning of 'Narcissistic'.

Q2) Attempt any two of the following in eight or ten sentences :

[8]

- a) Outline Murstein's stage theory of mate selection.
- b) Describe personal and family influences on job choice.
- c) Explain the most commonly used criteria of abnormality.

P.T.O.

Q3) Write short notes on any two of the following : **[8]**

- a) Concept of adjustment.
- b) Prevalence of cohabitation.
- c) Obsessive-compulsive disorder (OCD).

Q4) Explain how health, social activity, religion and culture are related to happiness. **[8]**

OR

Describe Holland's hexagonal model of career choice.



Total No. of Questions : 4]

[Total No. of Pages : 1

P753

[3617]- 120

S.Y. B.Sc.

PSYCHOLOGY

Experimental Psychology

(Paper - II) (Sem.-I) (New Course)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) Attempt all questions.*
- 2) Draw the figures and diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer in two or four sentences : **[16]**

- a) What is refinal colour zone?
- b) How the light intensity can be measured?
- c) What is tactile space perception?
- d) Enlist the types of stereoscopes in studying depth effects.
- e) What is stereoscopic vision?
- f) How head and eye movements influence perception of movement?
- g) What is thinking?
- h) What is abstraction in thinking?

Q2) Attempt any two of the following in eight to ten sentences. **[8]**

- a) Explain the main parameters of conditioning experiments.
- b) Discuss the trail and error in thinking and problem solving.
- c) Explain the monocular cues.

Q3) Write short notes on any two of the following : **[8]**

- a) Dark adaptation.
- b) Secondary reinforcement in classical conditioning.
- c) Insight in problem solving.

Q4) What is conditioning? Explain the main concepts of conditioning. **[8]**

OR

Critically explain the significance of visual activity.



P754

[3617]- 125

S.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

**DS NO. - 101 : International Relations and Foreign Policy
(Sem.-I) (New Course) (2008 Pattern)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each : **[16]**

- a) Define “International Relations”.
- b) State any two determinants of “Foreign Policy”.
- c) How you would like to define “National Interest”.
- d) What do you mean by “Realistic Approach”?
- e) State the meaning of National Power.
- f) What do you mean by “International Community”?
- g) What do you understand by “Elements of National Power”?
- h) State the basic purpose of “National Interest”.

Q2) Answer in 8 to 10 sentences each (any two) : **[8]**

- a) Explain the concept of “International Relations”.
- b) Highlight on any one basic tenets of Indias foreign policy.
- c) Write in brief “Idealist Theory”.

Q3) Write short notes on (any two) : **[8]**

- a) Necessity of International Relations.
- b) Industrial capacity-As a Element of National Power.
- c) Scope of International Relations.

Q4) Answer in 16 to 20 sentences (any one) : **[8]**

- a) Explain any two basic determinants of Indias foreign policy.
- b) How you consider the “Economic development” as an element of National Power?



Total No. of Questions : 4]

[Total No. of Pages : 2

P755

[3617]- 126

S.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS. NO. - 102 : Elements of National Security

(Sem.-I) (New) (2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer in 2 to 4 sentences :

[16]

- a) Explain the meaning of non-military threats.
- b) Define military 'Technology'.
- c) State the meaning of 'Economic development'.
- d) Write any two elements of the modern nation state.
- e) Define Diplomacy.
- f) What do you mean by strategic planning?
- g) Explain the meaning of economic sustainability.
- h) State the meaning of military power.

Q2) Answer in 8 to 10 sentences (any two) :

[8]

- a) State the objectives of National Security.
- b) Explain the concept of Nation.
- c) Describe military diplomacy.

Q3) Write short notes on (any two) :

[8]

- a) New perspective on security.
- b) Defence planning.
- c) Research and development.

P.T.O.

Q4) Answer in 16 to 20 sentences (any one) :

[8]

- a) Discuss determinants of Defence Policy.
- b) Write a note on internal security challenges to India.



Total No. of Questions : 4]

[Total No. of Pages : 2

P756

[3617]- 127

S.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS. NO. - 103 : Geopolitics

(Sem.-I) (New Course) (2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each : [16]

- a) What do you mean by Geopolitics?
- b) In which part of the world maximum deposits of oil located?
- c) Define "Land Locked State".
- d) State the meaning of "Frontier".
- e) Define "Nation".
- f) State the uses of "Zinc".
- g) By which country first time "Natural Gas" it was used as a source of energy?
- h) What do you know about "Diego-Garcia" Islands?

Q2) Answer in 8 to 10 sentences each (any two) : [8]

- a) Explain the concept of Buffer States.
- b) Write in brief Geostrategic importance of "Israel".
- c) Explain the Geostrategic importance of "Kuwait".

Q3) Write short notes on (any two) : [8]

- a) Territorial water.
- b) Process of Delimitation.
- c) Antarctica - Geostrategic Importance.

P.T.O.

Q4) Answer in 16 to 20 sentences (any one) :

[8]

- a) Explain the importance of strategic minerals with special reference to its utility from defence preparedness point of view.
- b) Discuss any two factors of Geopolitics.



Total No. of Questions : 4]

[Total No. of Pages : 2

P757

[3617]- 156

S.Y. B.Sc. (Sem.-I)

CH - 211 : PHYSICAL CHEMISTRY

(21311) (Old)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic table and calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following :

[10]

- a) Define the term entropy.
- b) Give one use of Microsoft Excel.
- c) Write the relation between K_p & K_c .
- d) State the Raoult's law.
- e) Give the limitation of Nernst distribution law.
- f) Define normality.
- g) State the second law of thermodynamics in terms of entropy.
- h) Write the various forms of Clapeyron equation.
- i) Define the term molar heat of vaporisation.
- j) Name the colligative properties.

Q2) a) Attempt any two of the following :

[6]

- i) Explain the physical significance of entropy.
- ii) Show that the decrease in Helmholtz free energy is a measure of maximum work in an isothermal process.
- iii) What do you mean by abnormal molecular weights? Why are abnormal molecular weights observed?

b) Solve any one of the following :

[4]

- i) 5 moles of an ideal gas are heated from 400K to 425K, its volume changes from 10 liter to 100 liter. Find the entropy change.

$$[R = 8.314 \text{ J mole}^{-1}\text{K}^{-1}]$$

$$C_v = 12.5 \text{ JK}^{-1}$$

P.T.O.

- ii) A mixture of two immiscible liquids nitrobenzene and water boiling at 98.9°C has a partial vapour pressure of water 733mm and that of nitrobenzene 27mm. If the weight ratio of water to nitrobenzene is 4. Calculate the mol weight of nitrobenzene.

Q3) a) Attempt any two of the following : [6]

- i) Discuss with the help of neat diagram the effect of temperature on solubilities of phenol in water.
ii) What is spread sheet? Discuss the different parts of spread sheet.
iii) Show that it is better to extract with small volume of solvent several time than once with a large volume.

b) Solve any one of the following : [4]

- i) Calculate the free energy change when 15 moles of an ideal gas expands isothermally and reversibly from 5 liter to 50 liter at 27°C . [$R = 8.314 \text{ mole}^{-1} \text{ K}^{-1}$].
ii) 2gm of a nonvolatile solute was dissolved in 25gm of a solvent when the boiling point elevation of 0.4°C was observed. If K_b for the solvent is 1.15. Calculate the molecular weight of solute.

Q4) a) Attempt any one of the following : [6]

- i) Describe with the help of a neat sketch Landsberger's method of determining the molecular weight of given solute.
ii) Derive Clausius-Clapeyron equation.

b) Attempt any one of the following : [4]

- i) Define ideal and non ideal solutions. Draw the P-N diagrams for non-ideal solutions.
ii) Derive the equation $\pi = CRT$.

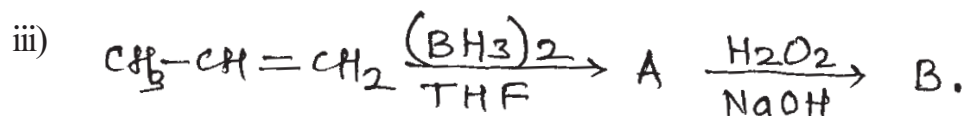
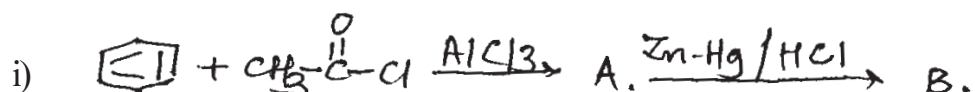


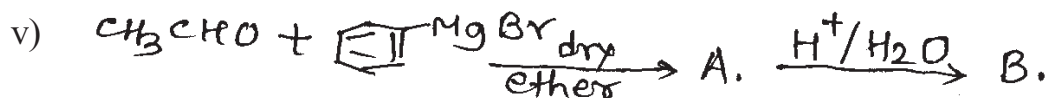
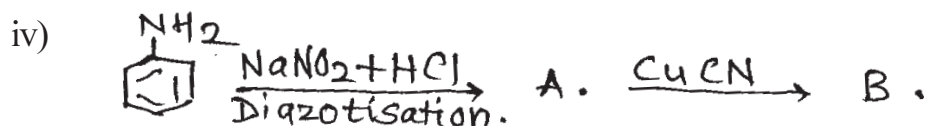
P758**[3617]-157****S.Y. B.Sc.****CHEMISTRY****CH - 212 : Organic Chemistry****(Old Syllabus) (Semester - I) (21321)****Time : 2 Hours]****[Max. Marks : 40****Instructions to the candidates:**

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw structures and diagrams if necessary.

Q1) Answer the following :**[10]**

- a) Define the term 'Optical activity'.
- b) Formaldehyde does not undergo Aldol condensation reaction. Why?
- c) Boiling point of propanoic acid is 141°C while n-butyl alcohol boils at 118°C. Why?
- d) Amines are basic in nature. Explain.
- e) What are heterocyclic compounds?
- f) What are step down reactions? Give one example.
- g) Draw the structure of Maltose.
- h) Define the term Epimers.
- i) Give the structure of LS-Alanine.
- j) Give the specific use of Sn/HCl reagent.

Q2) a) Assign the structures to 'A' and 'B' in the following reactions (any three):**[6]****P.T.O.**



b) How will you bring about following conversions. (any two) [4]

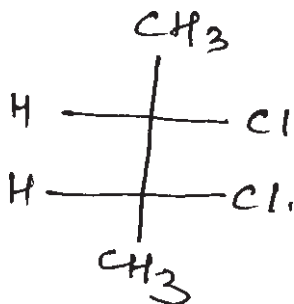
- Benzene into aniline.
- Acetic acid into methane.
- Ethanol into acetamide.

Q3) Attempt 'any two' of the following : [10]

- What are α -amino acids? What is the action of following reagent on α -amino acid.
 - Dansyl chloride
 - Nitrous acid.
- What are carbohydrates? How are they classified? Explain the reaction of D-Glucose with H_2/Ni and Br_2 water.
- Give the synthesis of pyridine. What is the action of following on thiophene.
 - Raney Ni
 - Coldconc. H_2SO_4
 - Aryl diazonium chloride.

Q4) a) Attempt 'any two' of the following : [6]

- Explain simple and cross Aldol condensation with suitable examples.
- Discuss in brief the effect of following on enzyme catalysed reaction.
 - Effect of changing enzyme concentration.
 - Effect of pH.
 - Effect of changing substrate concentration.
- How many optical isomers are possible for following molecule? Assign R & S configuration to the chiral centres.



- iv) Discuss the 'Sandmeyer's reaction' with suitable example.
- b) What are esters? How ethyl acetate is prepared from [4]
- i) Acetic acid.
 - ii) Acetyl chloride.

OR

- b) Explain the following terms with suitable example. [4]
- i) Locking of conformation.
 - ii) Angle strain.



P759

[3617]-158

S.Y. B.Sc.

BOTANY

**BO - 211 : Taxonomy of Angiosperms
(Paper - I) (Old Course) (Semester - I) [21411]**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following :

[10]

- a) What is taxonomy?
- b) What is ICBN?
- c) What is Phylogenetic system of classification?
- d) Give an example of family Solanaceae.
- e) What is RAM?
- f) Mention any importance of Herbaria.
- g) Define Botanical Garden.
- h) Mention the family with gynobasic style.
- i) Which is the largest botanical garden in India.
- j) What is a monograph?

Q2) Answer any two of the following :

[10]

- a) Write diagnostic characters of family Papilionace.
- b) Give salient features of Royal Botanical Garden.
- c) Describe various output devices of computer.

P.T.O.

Q3) Write notes on (any two) : **[10]**

- a) Rule of priority.
- b) Fruit of Annonaceae.
- c) Functions of BSI.

Q4) Write distinguishing characters, floral formula, floral diagram of family Cruciferae and Apocynaceae. **[10]**

OR

Give broad outline of Bentham and Hookers system of plant classification upto families studied by you.



P760

[3617]-159

S.Y. B.Sc.

BOTANY

**BO - 212 : Plant Ecology and Utilisation of Plants
(Paper - II) (Old Syllabus) (Semester - I) (21421)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following :

[10]

- a) Give the botanical name of chickpea.
- b) Give the centre of origin of sugarcane.
- c) Define species diversity.
- d) Define bio-geochemical cycle.
- e) Give the mechanical properties of wood.
- f) Enlist biotic components of ecosystem.
- g) Give any two uses of dyes.
- h) Enlist the types of fibres.
- i) Give any two adaptations of hydrophytes.
- j) What is ecological succession?

Q2) Answer any two of the following :

[10]

- a) Give the properties and uses of essential oils.
- b) What are vegetables oils? Give the uses of groundnut oil.
- c) Give the botanical name and uses of wheat.

P.T.O.

Q3) Write short notes on (any two) : **[10]**

- a) Plants as indicators of ground water.
- b) Describe the causes of ecological successions.
- c) Scope of plant ecology.

Q4) What are ecological pyramids? Describe the different types of ecological pyramids. **[10]**

OR

What are xerophytes? Describe the external and internal peculiarities of xerophytes.



P761

[3617]-160

S.Y. B.Sc.

ZOOLOGY

ZO - 211 : Animal Systematics and Diversity

(Paper - I) (Old Course) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following :

[10]

- a) Write the biological name of cockroach.
- b) Give any two examples of annelida.
- c) Define regeneration.
- d) Define moulting.
- e) What is the location of madreporite?
- f) Give the function of water vascular system.
- g) What is the function of spiracle?
- h) Write any two functions of body wall of starfish.
- i) What do you mean by open type of circulation?
- j) Mention any two names of starfish larvae.

Q2) Write short notes on (Any Two) :

[10]

- a) Straight type of pedicellariae.
- b) Antenna of cockroach.
- c) Leg of cockroach.

P.T.O.

Q3) Attempt the following (Any Two) : **[10]**

- a) Describe sponging type of mouth parts.
- b) Write any five characters of platyhelminthes.
- c) Explain ommatidium of cockroach.

Q4) Describe in details the alimentary canal of cockroach. Add a note on physiology of digestion. **[10]**

OR

Describe digestive system of starfish. Add a note on feeding mechanism.



P762

[3617]-161

S.Y. B.Sc.

ZOOLOGY

ZO - 212 : Applied Zoology (Fisheries and Poultry)

(Paper - II) (Old Course) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following :

[10]

- a) Define Vermiculture.
- b) Write biological name of rohu.
- c) Mention the use of fish glue.
- d) Mention the use of built up boat.
- e) What is the function of Chalazae?
- f) What do you mean by Crafts?
- g) Define debeaking.
- h) Explain the term incubation.
- i) Enlist any two characters of leghorn.
- j) Define canning.

Q2) Write short notes on (Any Two) :

[10]

- a) Pearl formation.
- b) Structure of hen's egg.
- c) Simple water fountain.

P.T.O.

Q3) Answer the following (Any Two) : **[10]**

- a) Sketch & label morphology of Gallus gallus.
- b) Write note on poultry sanitation.
- c) Describe catamaran.

Q4) Describe different types of gears used in Indian fisheries. **[10]**

OR

What is poultry? Describe in detail poultry feeding methods.



P787

[3617] - 31

F.Y. B.Sc.

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Basic Photography and Appreciation of Media

(New) (Paper - I) (Vocational)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

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

Q1) Answer the following :

[16]

- a) Name the different layers in a B/W printing paper.
- b) Write two equivalent exposures for: f 11 @ 1/125 sec.
- c) How do you analyse a photographic image on technical grounds?
- d) Compare the diffraction and refraction of light.
- e) Why is the mirror used in a SLR camera kept at 45° to the lens axis?
- f) Why is red light used as a safe light in a photographic darkroom?
- g) Explain what you mean by a sharp image.
- h) Draw a diagram to show spherical aberration.

Q2) Answer any four of the following :

[16]

- a) Explain the working of a focal plane shutter at fast shutter speeds.
- b) Draw a diagram and explain what you mean by the 'distortions' produced by a simple lens how are these corrected?
- c) Differentiate between small and large f numbers. How are these useful in photography?
- d) Explain how the grain size of a film affects the other properties of a film.
- e) What is the importance of gelatine in a photographic emulsion?
- f) What is the use of the developing agent in a B/W developer?

P.T.O.

Q3) Answer any four of the following : **[16]**

- a) Discuss how is the unsharpness of an image corrected in a SLR camera.
- b) Draw a schematic cross section of a B/W printing paper and explain the importance of each section.
- c) Discuss the advantages and disadvantages of a SLR camera.
- d) Explain what do you mean by a 'photo news'.
- e) Draw a neat diagram and describe a SLR camera.
- f) Explain the rule of thirds used in composing a photographic image.

Q4) Answer any two of the following : **[16]**

- a) Discuss the importance of photography in different walks of life.

OR

- a) Discuss the role of photography as a medium of mass communication. Give suitable examples.
- b) Draw a neat diagram and discuss the construction of a B/W film.

OR

- b) Draw a labelled diagram and describe various parts of a B/W enlarger.

Q5) Answer any one of the following : **[16]**

- a) How would you assess a photograph if you were asked to work as jury in a photography competition?
- b) Describe the photographic process completely. Clearly mention the various stages and the nature of images on the film at each stage.



P788

[3617] - 38

F.Y. B.Sc.

STILL PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Introduction to Mass Communication and Media Scene in India

(New) (Paper - II) (Vocational)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Give suitable examples and draw neat and labelled diagrams wherever necessary.*

Q1) Attempt any two of the following : **[16]**

- a) Give suitable examples and explain difference between interpersonal, group and mass communication.
- b) Discuss the Radio as a medium of mass communication. How effective is it in a country like India.
- c) What do you understand by 'News Value' and what are the various news values? Elaborate with suitable examples.

Q2) Attempt any four of the following : **[16]**

- a) Describe the role of an Editor of a news paper.
- b) Discuss the internet as a medium of mass communication.
- c) Write a short note on 'inverted pyramid'.
- d) Write a short note on cultural communication.
- e) What are the similarities and the differences between the press and other industries?
- f) How would you prepare for the interview of the candidate winning a seat in the Assembly elections?

P.T.O.

Q3) Attempt any four of the following : **[16]**

- a) What is the role of gate keepers in mass communication?
- b) Write a short note on proxemics.
- c) Discuss the various radio programmes broadcast by All India Radio.
- d) Discuss the features of intra personal communication.
- e) Give suitable examples and differentiate between a tabloid and a daily.
- f) Explain, with suitable example, the concept of 5Ws and 1H.

Q4) Attempt any two of the following : **[16]**

- a) Discuss the role of media reach in mass communication.
- b) Discuss the organizational structure of a news paper and the role of various people in it.
- c) Draw a block diagram and discuss Communication as a process. Give suitable examples to justify your answer.

Q5) Attempt any two of the following : **[16]**

- a) In a country like India, which of the Radio, TV and News paper is more effective medium of mass communication? Justify with suitable examples.
- b) Analyze your favourite TV programme in details.
- c) Give suitable examples and describe various shot sizes used in a video production.



P789

[3617] - 135

S.Y. B.Sc.

BIOTECHNOLOGY

VOC. Biotech - 211 : Cell and Molecular Biology

(New Course) (Paper - I) (Sem. - I) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer each of the following (1 - 2 lines) :

[10]

- a) Mention the components of Endoplasmic reticulum.
- b) What is cell fractionation?
- c) Define neoplasm.
- d) What is active transport?
- e) Define symport.
- f) Give meaning of genome.
- g) State functions of sigma (σ) factor.
- h) Name the subunits of eukaryotic ribosome.
- i) Mention the organelles, which have DNA in them.
- j) What is monocistronic gene?

Q2) Attempt any two of the following :

[10]

- a) Give functions of mitochondrion.
- b) Describe transcriptional apparatus.
- c) Explain in brief the prokaryotic promoter.

P.T.O.

Q3) Write short notes on any two of the following :

[10]

- a) Cell signalling.
- b) Operon.
- c) Cell junctions.

Q4) What is DNA replication? Describe the mechanism of DNA replication. **[10]**

OR

What is translation? Describe various steps involved in translation.



P790

[3617] - 136

S.Y. B.Sc.

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Still Photography & Camera Accessories

(New Course) (Paper - III) (Sem. - I) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following :

[16]

- a) Draw a diagram and explain the concept of 'depth of focus'.
- b) Explain the significance of a 'point' as an element of composition.
- c) Draw a diagram and compare the angle of view of a normal lens and a telephoto lens.
- d) If the focal length of a lens is 75mm calculate its diopetre.
- e) What is the advantage of the 'matrix' metering pattern?
- f) Explain the use of hard light.
- g) Draw a suitable diagram and explain 'vignetting' observed in a photographic image.
- h) How would you enhance the contrast between the white clouds and the blue sky? Explain.

Q2) Attempt any two of the following :

[8]

- a) Discuss the features of a normal lens.
- b) Compare a wide angle and a telephoto lens.
- c) Explain what you mean by 'Callier effect'.

P.T.O.

Q3) Attempt any two of the following : **[8]**

- a) Draw a labelled diagram and explain a flash curve.
- b) Explain how light is useful in photography.
- c) Discuss, with examples, the use of contrast filters in Photography.

Q4) Attempt any one of the following : **[8]**

- a) Draw a diagram and show the basic three light set up used for portrait lighting. Clearly explain the function of each light used in the set up.
- b) Draw a diagram and show the construction of an electronic flash. Explain the function of each component.



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[3617] - 137

S.Y. B.Sc.

ELECTRONIC EQUIPMENT MAINTENANCE

VOC. EEM - 211 : Audio, Video & Office Equipments - A

(New Course) (Paper - I) (Sem. - I) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.***
- 2) Figures to the right indicate full marks.***
- 3) Use of calculator / log table is allowed.***

Q1) Answer the following :

- a) Give the width of standard TV channel in India. **[1]**
- b) What is 'high fidelity' music system? **[1]**
- c) State the need of AC bias in a tape recorder. **[1]**
- d) Define-sidebands. **[1]**
- e) What are the primary colours used in TV system? **[2]**
- f) Why is rotating head mechanism needed in VCR? **[2]**
- g) What is the need of interlace scanning? **[2]**
- h) Picture signals are converted to FM before recording on video tapes. Comment. **[2]**

Q2) Answer any two :

- a) Describe a complete frame of interlaced scanning used in India. **[4]**
- b) Explain the recording and playback in ACD player. **[4]**
- c) Draw a neat labeled diagram of black and white picture tube. **[4]**

P.T.O.

Q3) Answer any two :

- a) Explain the requirements of PA system. [4]
- b) State various receiver characteristics and explain any two of them. [4]
- c) Describe the receiver principles in mobile phone. Comment on the frequency usage. [4]

Q4) Answer the following :

- a) Describe the satellite (dish TV) receiver with the help of neat block diagram. [6]
- b) Draw a neat diagram of DVD player and explain its working. [6]

OR

- a) Explain the scanning & synchronization section of the TV receiver. [6]
- b) Describe the CCTV system in brief. [6]



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[3617] - 142

S.Y. B.Sc.

BIOTECHNOLOGY

**VOC. Biotech 212 : Recombinant DNA Technology and Bioinformatics
(New Course) (Paper - II) (Sem. - I) (Vocational)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.***
- 2) Figures to the right indicate full marks.***
- 3) Neat diagrams must be drawn wherever necessary.***
- 4) All questions carry equal marks.***

Q1) Answer each of the following in (1-2) lines :

[10]

- a) What is rDNA Technology?
- b) Enlist any two methods of transfection.
- c) What are DNA modifying enzymes?
- d) Give any two applications of PCR.
- e) Define Proteomics.
- f) What is YAC?
- g) Differentiate between blunt ends & sticky ends.
- h) Enlist the methods of selection of transformants.
- i) What is DNA-Sequencing?
- j) Give any two applications gene cloning.

Q2) Write short notes on 'any two' of the following (8-10 lines) :

[10]

- a) Restriction Endonucleases.
- b) Genomics.
- c) Southern Hybridization.

P.T.O.

Q3) Attempt 'any two' of the following (8-10 lines) : **[10]**

- a) Explain in brief the technique of polymerase chain Reaction.
- b) Give the applications of r-DNA technology.
- c) Explain in brief Sanger-Coulson method of DNA sequencing.

Q4) Define vector. Give the properties of good vector. Why they are necessary in r-DNA technology. **[10]**

OR

What is transformation? Describe the Agrobacterium tumefaciens mediated gene transfer in plant cell.



P793

[3617] - 143

S.Y. B.Sc.

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Principles of Acoustics and Sound for Media

(New Course) (Paper - IV) (Sem. - I) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt all the following :

[16]

- a) Define IL and PWL.
- b) Sketch a diagram of a reverberation chamber.
- c) Determine the Intensity of a source of sound whose IL = 60dB.
- d) State the requirements for good Acoustics of an Auditorium.
- e) Sketch a diagram of a horn loudspeaker.
- f) State the characteristics of a microphone.
- g) The output of a microphone is 100mV for a pressure of 0.1Pa at 1kHz. Determine its sensitivity in dB below 1volt.
- h) State the characteristics of a HI-FI system.

Q2) Attempt any two of the following :

[8]

- a) What is a cross-over network? Explain the working of a two-way cross-over network.
- b) Distinguish between monophonic and stereophonic sound recording and reproducing systems.
- c) Discuss the working of a direct radiator Loudspeaker.

P.T.O.

Q3) Attempt any two of the following : **[8]**

- a) Explain the working of a moving coil microphone.
- b) Sketch a diagram of a P.A. system and explain its working.
- c) The reverberation time of a classroom $10 \times 4 \times 5\text{m}$, when empty, is 1.4 sec. Determine the total absorption. Determine also the new reverberation time when 20 students are present in the classroom. (Given: The absorption of each student is 0.5 metric-sabins).

Q4) Attempt any one of the following : **[8]**

- a) Sketch a block diagram of a magnetic tape recording and reproducing system. Explain, in brief, the function of the main parts.
- b) Write short notes on :
 - (i) Carbon microphones
 - (ii) Audio delayers.



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[3617] - 144

S.Y. B.Sc.

ELECTRONIC EQUIPMENT MAINTENANCE

VOC. EEM - 212 : Maintenance Concepts and Repair II - A

(New Course) (Paper - II) (Sem. - I) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.***
- 2) Figures to the right indicate full marks.***
- 3) Neat diagrams must be drawn wherever necessary.***
- 4) Use of log tables and/or calculators is allowed.***

Q1) Answer all of the following :

- a) What is the unit of failure rate? Define it. [1]
- b) Preventive maintenance decreases MTBF state whether true or false.[1]
- c) Solvents, adhesives, lubricants, freeze sprays are together called as _____tools. [1]
- d) What are buffered test points? [1]
- e) Differentiate between 'preventive Maintenance' and 'Corrective Maintenance'. [2]
- f) What are the potential problems that one may face in maintaining Electronic Equipment? [2]
- g) Define 'Availability' of an instrument. On what factors does it depend?[2]
- h) What is the effect of dust on reliability? Explain. [2]

Q2) Answer any two of the following :

- a) Compare lead acid battery with the Ni-Cd type. [4]
- b) State the necessity of providing suitable physical environment for installation of equipment and explain various considerations involved in it. [4]
- c) Describe the preventive maintenance schedule of a PC. [4]

P.T.O.

Q3) Answer any two :

- a) State the typical faults observed in CRO and the remedies suggested. **[4]**
- b) Explain the terms 'passive redundancy' and 'active redundancy' using appropriate diagram/s. **[4]**
- c) What are the 'improper' ways of handling equipment, which cause the equipment failure? **[4]**

Q4) Answer all :

- a) Define quality. Explain with reference to electronic product. Explain the scope of ISO 9000 to ISO 9004 series in brief. **[6]**
- b) Explain typical contents of a service manual of any T&M equipment in your laboratory. Explain the use of service manual. **[6]**

OR

- a) Write a note on 'plate earthing'. Why is 'earthing' of equipment necessary? **[6]**
- b) What are the hazards involved in handling of electronic systems? Explain the safety measures required to be taken to overcome these hazards. **[6]**



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[3617] - 187

S.Y. B.Sc.

BIOTECHNOLOGY

VOC. Biotech - 211 : Molecular Biology

(Old Course) (Paper - I) (Sem. - I) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.***
- 2) Figures to the right indicate full marks.***
- 3) Neat diagrams must be drawn wherever necessary.***
- 4) All questions carry equal marks.***

Q1) Answer each of the following (1-2 lines) :

[10]

- a) Define Transition mutation.
- b) What are nucleotides?
- c) Write the importance of promoter in DNA transcription process.
- d) Give the role of disulfide linkage in protein structure.
- e) Name the important protein encoded by chloroplast genome.
- f) Enlist different forms of RNA.
- g) What is poly A tail?
- h) What are N-linked glycoproteins?
- i) Enlist the different stop codons.
- j) What is Rho-independent termination of transcription?

Q2) Write short notes on any two of the following (8-10 lines) :

[10]

- a) Translation initiation in prokaryotic cell.
- b) SOS repair.
- c) DNA polymerase - I enzyme.

P.T.O.

Q3) Attempt any two of the following (8-10 lines) : **[10]**

- a) What are nucleosomes? Give the role of histone proteins in nucleosome structure.
- b) Explain “the effect of environment on gene expression” with suitable example.
- c) Define genetic code. Add a note on it's properties.

Q4) Discuss in detail the process of DNA replication in prokaryotes. **[10]**

OR

What is operon? Describe ‘tryptophan operon’. Elaborate regulation of expression by ‘Attenuation’.



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[3617] - 188

S.Y. B.Sc.

STILL PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Still Photography, Processing & Printing

(Old Course) (Paper - III) (Sem. - I) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following :

[16]

- a) Draw a diagram and explain the concept of 'depth of focus'.
- b) What are the factors that affect the 'depth of field'?
- c) Draw a diagram to show the angle of view of a normal lens.
- d) State the law of 'Reciprocity'.
- e) What is the drawback of an 'average' metering pattern?
- f) Explain the use of hard light.
- g) Explain what you mean by 'Optical materials'.
- h) How would you enhance the contrast between the white clouds and the blue sky? Explain.

Q2) Attempt any two of the following :

[8]

- a) Discuss the features of a normal lens.
- b) Compare a wide angle and a telephoto lens.
- c) Explain what you mean by 'Callier effect'.

P.T.O.

Q3) Attempt any two of the following : **[8]**

- a) Explain the developing process of a B/W film.
- b) Discuss the effect of over and under exposure on a photographic image.
- c) Discuss, with examples, the use of contrast filters in Photography.

Q4) Attempt any one of the following : **[8]**

- a) Draw a diagram and show the basic three light set up used for portrait lighting. Clearly explain the function of each light used in the set up.
- b) Draw a diagram and show the construction of an electronic flash. Explain the function of each component.



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[3617] - 189

S.Y. B.Sc.

ELECTRONIC EQUIPMENT MAINTENANCE
VOC. EEM - 211 : Audio, Video & Office Equipments - A
(Old Course) (Paper - I) (Sem. - I) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of calculator/log table is allowed.*

Q1) Answer the following :

- a) Give the FM-frequency range allotted to the receiver. [1]
- b) What is the principle of Touch screen? [1]
- c) State the long form of CATV. [1]
- d) What are the advantages of MP3 files over traditional audio files? [1]
- e) Write the super hetero-dyne principle. [2]
- f) What is need of local oscillator in radio receiver? [2]
- g) State the role of IF tuner in radio. [2]
- h) Why is FM preferred over AM? [2]

Q2) Answer any two :

- a) Explain the CCTV system. [4]
- b) Draw a neat block diagram of FAX system. [4]
- c) Write short note on-Data projector. [4]

Q3) Answer any two :

- a) Draw a neat labeled diagram of sound section of TV receiver. [4]
- b) Explain the working of ACD player. [4]
- c) Describe the working of laser printer. [4]

P.T.O.

Q4) Answer the following :

- a) Explain the construction of Xerox machine with the help of neat diagram. [6]
- b) Describe the recording mechanism in the VCR system. [6]

OR

- a) Explain the working of PA system with the help of neat block diagram. [6]
- b) Write note on-Large screen display and rolling displays. [6]



Total No. of Questions : 4]

[Total No. of Pages : 2

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[3617] - 194

S.Y. B.Sc.

BIOTECHNOLOGY

VOC. Biotech - 212 : Biophysics

(Old Course) (Paper - II) (Sem. - I) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) All questions carry equal marks.*

Q1) Answer each of the following in 1-2 lines :

[10]

- a) What are X-rays?
- b) Define Biophysics.
- c) Give two examples of inter molecular interactions.
- d) What are optical filters?
- e) Give two applications of NMR imaging.
- f) What is fluorescence?
- g) What is EEG?
- h) Give the function of tympanum membrane in human ear.
- i) What is heat dissipation?
- j) What is the source of radiations in IR spectrophotometer?

Q2) Write short notes on 'any two' of the following (8-10 lines) :

[10]

- a) ECG.
- b) Light reception in plants.
- c) Applications of ultrasound in medicine.

P.T.O.

Q3) Attempt 'any two' of the following (8-10 lines) : **[10]**

- a) What is X-ray crystallography? Give its applications.
- b) Give principle and applications of IR-spectroscopy.
- c) Describe measures to rectify various vision faults.

Q4) What is UV-Vis spectroscopy? Describe its instrumentation & principle. Add a note on its applications. **[10]**

OR

Describe principle and applications of EEG in medicine.



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[3617] - 195

S.Y. B.Sc.

STILL PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Principles of Acoustics

(Old Course) (Paper - IV) (Sem. - I) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.***
- 2) Draw neat and labeled diagrams wherever necessary.***
- 3) Figures to the right indicate full marks.***

Q1) Attempt all the following :

[16]

- a) Define Reverberation time. State Sabine's formula for reverberation time.
- b) What is a woofer? Where is it used?
- c) Determine the Intensity of a source of sound whose Intensity Level is 60dB.
- d) Sketch a diagram of a reverberation chamber.
- e) The wavelength of a sound wave of 1kHz in air is found to be 34 cm. Determine the velocity of sound in air.
- f) Sketch a diagram of a horn loudspeaker.
- g) What is Dead room?
- h) State the properties of a sound wave propagating in air.

Q2) Attempt any two of the following :

[8]

- a) Explain the analogies between Acoustical, Mechanical and Electrical systems.
- b) What are audio delayers? Explain their use. Sketch the necessary diagram.
- c) Discuss the use of a Public Address system in an Auditorium.

P.T.O.

Q3) Attempt any two of the following : **[8]**

- a) What is a cross-over network? Sketch a block diagram for the use of a two way cross-over network.
- b) Discuss the working of a direct radiator loudspeaker.
- c) The Reverberation time of a classroom $5 \times 8 \times 10$ m, when empty, was found to be 1.4sec. Determine the effective absorption coefficient of the surfaces in the classroom. Determine also, the new Reverberation time when 20 students are present in the classroom. (Given : The absorption of each student is 0.5 metric-sabins.)

Q4) Attempt any one of the following : **[8]**

- a) Discuss the test to be carried to determine the frequency response of a loudspeaker.
- b) Write short notes on the following :
 - i) Articulation test.
 - ii) Graphic Equalizers.



P800

[3617] - 196

S.Y. B.Sc.

**ELECTRONIC EQUIPMENT MAINTENANCE (EEM)
VOC-EEM - 212 : Maintenance Concepts and Repair II - A
(Old Course) (Paper - II) (Sem. - I) (Vocational)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of log table/calculator is allowed.*

Q1) Answer the following

- a) Attempt the following : **[4 × 1 = 4]**
 - i) What does 'Servicing' mean?
 - ii) What is 'Maintainability'?
 - iii) Define failure rate.
 - iv) List typical causes of failure in an equipment.
- b) Attempt the following : **[2 × 2 = 4]**
 - i) What is buffer test point?
 - ii) State the factors on which MTBF depends.
- c) Attempt the following : **[2 × 2 = 4]**
 - i) Give types of failure.
 - ii) State the difference between 'test equipment' and 'measuring equipment'.

Q2) Answer any two of the following : **[2 × 4 = 8]**

- a) Write a note on 'tools and aids for servicing and maintenance'.
- b) State the guidelines for drawing schematics diagrams. Draw circuit diagram as an example and also indicate meaning of the symbols.
- c) What is 'Maintenance policy'? Explain importance of proper policy for best results.

P.T.O.

Q3) Answer any two of the following :

[2 × 4 = 8]

- a) Give importance of service manual.
- b) Write a short note on 'Availability'.
- c) Write a note on preventive maintenance.

Q4) Answer the following :

[2 × 6 = 12]

- a) Name the tools and give its purpose for servicing and maintenance.
- b) What are series, parallel and series-parallel redundancy systems? Give example of each.

OR

- a) Define each of the following terms.
 - i) Troubleshooting.
 - ii) Calibration.
 - iii) Repair.
- b) What attributes should a service engineer possess to become successful in his profession?



P801

[3617] - 237

S.Y. B.Sc.

STILL PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Colour Photography

(Old Course) (Paper - III) (Sem. - II) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer in short :

[16]

- a) Explain how Neutral density filter is useful in colour photography.
- b) Draw a curve to indicate the spectral response of the human eye.
- c) Explain the difference between a tungsten film and a daylight film.
- d) Explain which safe lights are used in a B/W darkroom while printing. Why are these useful?
- e) Explain the difference between a colour negative film and a colour positive film.
- f) Explain the difference between a colour positive film and a colour printing paper.
- g) What do you mean by the colour conversion filters?
- h) How are light sources classified on the basis of their origin?

Q2) Attempt any two of the following :

[8]

- a) Draw a labelled diagram of the cross section of a colour negative film.
- b) Discuss how colour filters are used in a colour enlarger.
- c) Explain what you mean by a Mired shift. What is positive and negative Mired shift? How are these corrected?

P.T.O.

Q3) Write short notes on any two of the following : **[8]**

- a) RA-4 process.
- b) Colour temperature.
- c) Removal of excess colour from a colour print.

Q4) Attempt any one of the following : **[8]**

- a) Discuss the various stages involved in the processing of a colour negative film.
- b) Draw a labelled diagram and describe the construction of a colour enlarger.



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[3617] - 244

S.Y. B.Sc.

STILL PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Sound for Media

(Old Course) (Paper - IV) (Sem. - II) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt all of the following :

[16]

- a) Define Signal to Noise ratio of a microphone.
- b) Define a sound recording and reproducing system.
- c) Sketch the directional characteristics of a condenser microphone.
- d) The sensitivity of a microphone is 20dB below 1 volt. Determine its output voltage.
- e) Sketch a diagram of a monophonic sound recording and reproducing system.
- f) In a magnetic tape recording system, the gap width is 10 microns and the tape speed is 18 cm/sec. Determine the highest frequency that can be recorded.
- g) State the characteristics of a HI-FI system.
- h) Compare two characteristics of carbon and ribbon microphones.

Q2) Attempt any two of the following :

[8]

- a) Explain, with a suitable example, noise reduction in a magnetic tape recording and reproducing system.
- b) Distinguish between condenser and crystal microphones.
- c) Explain the production of Electronic music.

P.T.O.

Q3) Attempt any two of the following : **[8]**

- a) Sketch a diagram of a moving coil microphone and explain its working principle. How can its output voltage be increased?
- b) Distinguish between stereophonic and monophonic sound recording and reproducing systems.
- c) Explain the function of erase and reproduce heads in a tape recording and reproducing system.

Q4) Attempt any one of the following : **[8]**

- a) Sketch a block diagram of a magnetic tape recording and reproducing system. Explain, in brief, the function of the main parts.
- b) Write short notes on :
 - i) Surround systems.
 - ii) Characteristics of music.



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S.Y. B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

VOC-IND-MIC - 211 : Bioreactors - Design and Operation

(Paper - I) (Sem. - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) All questions carry equal marks.*
- 4) Draw neat, labeled diagrams wherever necessary.*
- 5) Use of scientific calculators is allowed.*

Q1) Answer each sub-question in one or two lines; state whether the statement is True or False. **[10]**

- a) Name the type of compressor used in an air-sterilization process in a fermentation industry.
- b) Name any one microbial metabolite produced using a continuous fermentation process.
- c) State one advantage of using 'fibrous filters' instead of 'absolute filters' for sterilization of air.
- d) State any two major functions of agitation of a fermentation broth.
- e) Define 'sterilization criterion'.
- f) Define 'on-line sensor' used to measure a fermentation parameter.
- g) State why 'exit-gas' from a fermenter should be sterilized before it is let out into the atmosphere.
- h) Give one reason why some fermentation medium components cannot be steam sterilized.
- i) Give two reasons why stainless steel 316 is the most preferred construction material for fermenters.
- j) State why the H/D ratio of production scale fermenters is usually less than the same ratio in laboratory fermenters.

P.T.O.

Q2) Answer any two of the following : **[10]**

- a) Describe the structure of a spiral heat-exchanger. Explain its use in the fermentation industry.
- b) Explain the principle of operation of a sensor used for monitoring dissolved oxygen concentration during a fermentation process. State the importance of dissolved oxygen concentration for a microbial process.
- c) Draw a diagram of a fibrous filter used in the air sterilization process during fermentation processes. Explain the mechanisms operative in a fibrous filter for removal of organisms.

Q3) Answer any two of the following : **[10]**

- a) Describe any two types of valves used in fermentation equipment.
- b) Explain the construction of boilers used for steam generation in a fermentation industry, and give their role.
- c) List the differences between batch, fed-batch and continuous culture fermentation processes.

Q4) Answer any one of the following : **[10]**

- a) Draw a neat, labeled diagram of a typical continuously stirred tank reactor (fermenter). List the different parts and explain their function / role during a fermentation.
- b) Several factors of a fermentation process affect the design of a fermenter. List the factors that affect design and explain at least two of them in detail.



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S.Y. B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

**VOC-IND-MIC - 212 : Screening and Process Optimisation
(Paper - II) (Sem. - I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *Draw neat, labeled diagram wherever necessary.*

Q1) Answer each subquestions in one or two lines, fill in the blanks; state whether the statement is true or false : **[10]**

- a) State the major disadvantage of using liquid nitrogen in the storage method for microbial culture.
- b) Give the name of any one compound which can affect the broth rheology at the beginning of the fermentation.
- c) Give the names of two mineral salts which are introduced to supply trace elements.

Fill in the blanks.

- d) Presence of _____ in medium induces amylase production by organism.
- e) In media designing, factors not assigned to a variable can be designated as _____.
- f) Media used for animal cell culture can be sterilised by _____.

State whether the following statements are true or false.

- g) The sequence of test events shown below is correct procedure for screening of medium components, Plackett-Burman Design, then Response surface methodology then full factorial design.
- h) 'Cost' is the most important operational parameter that needs to be scaled up during a fermentation process.
- i) Cell mass in production scale fermenter is usually measured directly as absorbance.
- j) Buffers can not replace neutralising agents/pH regulators for a fermentation process.

P.T.O.

Q2) Answer any two of the following : **[10]**

- a) What is feed back inhibition? How are auxotrophic mutants useful in fermentation process for the over production of metabolite.
- b) Explain the role of laboratory-scale fermenter, in the scale-up process.
- c) Justify 'secondary screening is not a one-step process'.

Q3) Answer any two of the following : **[10]**

- a) Describe the importance of monitoring & controlling pH during fermenter process.
- b) What are the effects of foam & antifoam agents on oxygen transfer.
- c) What is the importance of Plackett-Burman design in fermentation media optimisation.

Q4) Answer any one of the following : **[10]**

- a) Discuss in detail the different methods of medium sterilisation.
- b) Describe the various raw material used as nitrogen source in fermentation media. State the names of media/products for which these raw materials are used for.

