Your Roll No...............

Sr. No. of Question Paper : 6775   **H C**

Unique Paper Code   :   42344304

Name of the Paper   :   Operating Systems

Name of the Course   :   **B.Sc. (Programme) / B.Sc. Mathematical Science**

Semester   :   III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. **Section A** is compulsory.

3. Attempt any **five** questions from **Section B.**

4. All parts of a question must be attempted together.

SECTION A

1. (a) Name two services provided by an operating system.

   (2)

   (b) How does an operating system prevent the CPU from being infinitely used by a user program? (2)

   (c) Differentiate between preemptive and non-preemptive CPU scheduling. (3)

P.T.O.

(d) List two system calls each, for process control, file management and device management. (3)

(e) Explain three advantages of a multiprocessor system? (3)

(f) What is the use of a page table in paged memory management? (3)

(g) What is address binding? (3)

(h) Explain two commands to compare files in unix operating system. (3)

(i) List three tasks performed by dispatcher in CPU Scheduling. (3)

SECTION B

*(Attempt any **five**)*

2. (a) Consider the following set of processes : (6)

Process	Arrival time	Burst time
P1	1	3
P2	0	6
P3	2	3
P4	3	5

(i) Draw Gantt charts showing execution of these processes using FCFS, RR (Quantum = 2) scheduling schemes.

(ii) Compute the response time and average waiting time in each scheme.

(b) Describe multilevel feedback queue scheduling. (4)

3. (a) Define a process. Explain different process states with the help of a diagram. (6)

(b) What are the responsibilities of an operating system with respect to

(i) File system management

(ii) Mass storage management (4)

4. (a) Differentiate between static and dynamic linking. (5)

(b) What are the reasons for a parent process to terminate execution of its child processes? (3)

(c) What is "cascading termination"? (2)

5. (a) Describe challenges in programming for multicore systems. (4)

(b) Assuming 1-KB page size, what are the page numbers and offsets for the following address references?

(i) 2375

(ii) 33

(iii) 14866 (3)

(c) What are the advantages of virtual memory? (3)

6. (a) Given memory partitions of sizes 200KB, 600KB, 100KB, 300KB and 500KB (in order). How would each of the first fit, best fit and worst fit algorithm place processes of sizes 350 KB, 150KB, 250KB and 450 KB (in order)? Which algorithm makes the most efficient use of memory? (6)

(b) What is external fragmentation? How can it be reduced? (4)

7. (a) Write a shell script to count the number of occurrences of the word "computer" in a file named "info.doc". (2)

(b) Write a shell script to count the number of files in the current working directory. (2)

(c) How does the dual mode operation protect the operating system from errant users? (4)

(d) What is the difference between the logical and physical address? (2)

8. Write short notes on any **two** :

(i) Segmentation scheme of memory Allocation

(ii) Unix System Architecture

(iii) Page fault handling (10)

(1500)

16/12/17

Your Roll No..............

Sr. No. of Question Paper : 6778   IIC

Unique Paper Code   : 42354302

Name of the Paper   : Algebra

Name of the Course   : **B.Sc. Physical Sciences /
Mathematical Sciences/
Analytical Chemistry (Part-II)**

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **any two** parts from each questions.

3. **All** questions are compulsory.

4. Marks are indicated.

Unit-I

1. (a) Define Group. Show that in a group G, the right and left cancellation laws hold. (6)

   (b) Let G be a group. Prove that G is abelian if and only if $(ab)^{-1} = a^{-1}b^{-1}$ for all a and b in G. (6)

P.T.O.

(c) Let G be a group and H a nonempty subset of G. Then, show that H is a subgroup of G if ab^{-1} is in H whenever a and b are in H.   (6)

2. (a) Let $G = GL(2,R)$ and $H = \left\{ \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix} : a \text{ and } b \text{ are non zero integers} \right\}$. Prove or disprove that H is a subgroup of G.   (6)

(b) Let $G = \langle a \rangle$ be a cyclic group of order n. Then show that $G = \langle a^k \rangle$ if and only if $\gcd(k,n) = 1$.   (6)

(c) Let

$$\alpha = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 1 & 3 & 5 & 4 & 7 & 6 & 8 \end{bmatrix} \text{ and}$$

$$\beta = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 1 & 3 & 8 & 7 & 6 & 5 & 2 & 4 \end{bmatrix}$$

Compute each of the following:

· (a) Write α and β as product of disjoint cycles.

(b) Compute $\alpha\beta$ and α^{-1}.   (6)

3. (a) State Lagrange's theorem for groups. Show that group of prime order is cyclic.   (6)

(b) Suppose that a has order 15. Compute all the left cosets of $\langle a^5 \rangle$ in $\langle a \rangle$.   (6)

(c) Show that every permutation on a finite set can be written as a cycle or a product of disjoint cycles. (6)

Unit-II

4. (a) Let $S = \{a + bi : a,b \in \mathbb{Z}, b \text{ is even}\}$. Show that S is a subring of the ring $\mathbb{Z}[i]$ of Gaussian integers, but not an ideal of $\mathbb{Z}[i]$.   (6½)

(b) Define a ring and an integral domain. Give an example of a ring which is not an integral domain.   (6½)

(c) Prove that every finite integral domain is a field. (6½)

Unit-III

5. (a) Prove that the intersection of two subspaces of a vector space $V(F)$ is a subspace of $V(F)$. Is the result true for the union of two subspaces? If not, give example.   (6½)

P.T.O.

(b) Show that $S = \{(1,0,-1,0),\ (2,1,3,0),\ (-1,0,0,0),\ (1,0,1,0)\}$ is a linearly dependent set in $\mathbb{R}^4$.

(c) Let $\{a,b,c\}$ be a basis for the vector space $\mathbb{R}^3$. Prove that the set $\{a+b,\ b+c,\ c+a\}$ is also a basis of $\mathbb{R}^3$.

(6½)

6.   (a)   (i) Show that the mapping $T:\mathbb{R}^2 \to \mathbb{R}^3$ defined by $T(x_1,x_2) = (x_1,\ x_1 + x_2,\ x_2)$ is a linear transformation.

      (ii) Let $T : V \to W$ be a linear transformation. If v_1, v_2, v_3 are linearly dependent vectors in V, prove that $T(v_1), T(v_2), T(v_3)$ are linearly dependent in W.

(6½)

(b) Let $T:\mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation such that $T(1,1) = (1,3)$, $T(-1,1) = (3,1)$. Find $T(a,b)$ for any $(a,b) \in \mathbb{R}^2$.

(6½)

(c) Let $T:\mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation defined by $T(x,y) = (x,\ x + y,\ y)$, then find the range, rank, kernel and nullity of T.

(6½)

Sr. No. of Question Paper : 6878   HC

Unique Paper Code   : 42234301

Name of the Paper   : Physiology and Biochemistry

Name of the Course   : B.Sc. (Prog.)

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **five** questions in all, **two each** from Section A and Section B. **Q. No. 1** is compulsory.

3. Use separate sheets for Section A and Section B.

1. (a) Define the following terms:

    (i) Hemopoiesis

    (ii) Glycogenesis

    (iii) Peristalsis

    (iv) Saltatory conduction

P.T.O.

(v) Rate constant (5)

(b) Differentiate between the following pairs of terms:

(i) IPSP and EPSP

(ii) Glycolysis and gluconeogenesis

(iii) Tidal Volume and Vital Capacity

(iv) Transketolase and Transaldolase

(v) Tropic and Trophic Hormone (10)

(c) Expand the following terms:

(i) ACP

(ii) hCG

(iii) FAD

(iv) JGA (4)

(d) Give the location and function of the following:

(i) Schwann cells

(ii) Pyruvate dehydrogenase complex

(iii) Carnitine acyltransferase II

(iv) Transverse tubules (8)

SECTION-A

*(Attempt any **two** questions)*

2. (a) Discuss the sliding filament theory of muscle contraction in detail.

(b) Write briefly about the hormonal control of blood calcium levels. (9+3)

3. (a) Write in detail about the cardiac cycle.

(b) Explain the Oxygen dissociation curves (7+5)

4. Write short notes on any **three** of the following:

(i) Phases of an Action potential

(ii) Counter current exchanger

(iii) Carbohydrate and protein digestion

(iv) Hormonal Control of Menstrual cycle (4+4+4)

SECTION B

*(Attempt any **two** questions)*

5. (a) Elucidate the metabolic pathway of biosynthesis of palmitic acid.

(b) Diagrammatically represent the Urea Cycle. (8+4)

6. (a) Discuss the process of glycogenolysis. How is it regulated?

(b) Give an account of the Citric Acid Cycle. (6+6)

7. Write short notes on any **three** of the following:

(i) Fatty Acid Synthases

(ii) Pentose phosphate pathway

(iii) Oxidative phosphorylation

(iv) Allosteric enzymes (4+4+4)

Sr. No. of Question Paper : 6879   HC

Unique Paper Code   : 42164301

Name of the Paper   : Plant Anatomy and Embryology

Name of the Course   : **B.Sc. (Programme)**

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **Five** questions in all including Question No. 1 which is compulsory.

3. **All** questions carry equal marks.

4. Attempt **all** parts of a question together.

5. Draw **well-labelled** diagrams wherenver necessary.

1. (a) Fill in the blanks: (8×1=8)

    (i) _____ present in endodermis blocks the apoplasmic transport in the root.

    (ii) Vascular bundles developed in the pith region are called _____.

(iii) Polygonum and _____ are examples of monosporic type of embryo sac.

(iv) _____ discovered double fertilization in *Fritillaria*.

(v) Composite endosperm is present in _____

(vi) Occurrence of more than four spores in a tetrad is called _____

(vii) A vascular bundle which has strands of xylem and phloem on same radius is called _____ .

(viii) _____ type of parenchyma is present in the stem of *Hydrilla* which provides buoyancy.

(b) Define the following: (7×1=7)

  (i) Meristem

  (ii) Phellogen

  (iii) Open vascular bundle

  (iv) X-bodies

  (v) Circinotropus ovule

  (vi) Pollenkitt

  (vii) Ari

2.   Differentiate between any five of the following: (5×3=15)

  (i)   Collenchymay and sclerenchyma

  (ii)   Dicot and monocot embryo

  (iii)   Heartwood and sapwood

  (iv)   Amoeboid and glandular tapetum

  (v)   Structure of dicot and monocot stem

  (vi)   Ephydrophily and hyphydrophily

  (vii) Periderm and bark

3.   (i) Define stomata. Describe different types of stomata according to Metcalf and Chalk classification with the help of suitable examples and diagrams.   (8)

  (ii) What is endosperm? Briefly explain different types of endosperms with suitable examples and diagrams. (7)

4.   Write short notes on any **five** of the following: (5×3=15)

  (i)   Role of trichomes in plant defense

  (ii)   Cleavage polyembryony

  (iii)   Theories of shoot apical meristem

(iv) Practical applications of apomixis

(v) Anatomical adaptations in xerophytes

(vi) Male Germ Unit (MGU)

5. (i) Describe briefly the mechanisms that favour cross pollination. (8)

(ii) Describe secondary growth in dicotyledonous stem with the help of suitable examples. (7)

6. (i) What is tapetum? Enumerate the various functions performed by tapetum. (5)

(ii) Define agamospermy? Briefly mention its different types. (5)

(iii) What do you understand by seasonal activity of cambium? (5)

7. (i) Explain the ultrastructure of mature embryo sac with the help of suitable diagram. (7)

(ii) Describe the structure of seed. Briefly discuss various seed dispersal mechanisms. (5)

(iii) Write a short note on quiescent centre. (3)

Your Roll No...............

Sr. No. of Question Paper : 8296   HC

Unique Paper Code   : 32177902

Name of the Paper   : Inorganic Materials of Industrial Importance

Name of the Course   : **Chemistry : DSE**

Semester   : III / V

Duration : 3 hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **five** questions in all.

3. Question **1** is compulsory.

4. Attempt any **four other** questions. **All** questions carry equal marks.

1. (a) Fill in the blanks or mark **True/False** as required :

    (i) A .... battery cannot be recharged and has to be discarded after single use.

    (ii) .... catalysts are substances that retard a reaction.

P.T.O.

(iii) .... are low refractive index materials, generally white in colour, which are added to a paint formulation to increase its volume.

(iv) In chemical laboratories, ... glassware is preferred for apparatus which is graduated or needs to be strongly heated.

(v) Optical fibres function on the principle of ...., ...

(vi) Ammonium nitrate is an example of a .... Fertilizer.

(vii) Synthetic zeolites are preferred over natural zeolites for commercial catalytic processes. T/F

(viii) Vitrification is the process of crystallisation of glass. T/F

(b) Give one word/phrase for the following (any **five**) :

(i) The special oven in which annealing of glass articles is carried out.

(ii) Small hard balls produced by the sintering together of limestone and aluminosilicate materials in a cement kiln.

(iii) Additives in an emulsion paint formulation which prevent excessive foam formation during manufacturing.

(iv) Common impurity in urea fertiliser which is toxic to plants.

(v) The process of applying a protective zinc coating to iron or steel.

(vi) Failure of a paint film by peeling off from the surface.

(vii) The special name given to the oxide $YBa_2Cu_3O_7$. (10,5)

2. (a) Distinguish between the following (any **two**) :

(i) Physical Vapour Deposition and Chemical Vapour Deposition

(ii) Wet and dry process for the manufacture of cement

(iii) Soda lime glass and borosilicate glass

(b) Explain with a diagram the working of Wilkinson's catalyst for the hydrogenation of alkenes. How can the process be made enantioselective in case only one enantiomer of the resulting chiral alkane is desired?

(c) Write the discharging and charging reactions of a lead storage battery and explain how the battery works. Why is this battery still popular despite its bulk and weight?   (2½×2,5,5)

3. (a) Classify the following as direct or indirect fertilizers :

   (i) Calcium superphosphate

   (ii) Calcium carbonate

   (iii) Ammonium nitrate

   (iv) Gypsum

   (b) How does urea function as an effective fertiliser for plants? Give one method for the manufacture of urea.

   (c) How does a flame-retardant paint work? Mention the functions of the following additives in a paint formulation.

   (i) Emulsifying agent

   (ii) Anti-skinning agent

   (iii) Plasticiser

   (d) Why is it necessary to add a retardant to cement? Give an example of a retardant and explain with chemical reactions how it functions in retarding the setting of cement.   (2,3,5,5)

4. (a) The trend in the rate of hydrogenation of some alkenes by Wilkinson's catalyst follows the order cyclohexene > cis-4-methyl-2-pentene > 1-methylcyclohexene. Explain this trend and identify the step in the catalytic cycle that is most affected.

   (b) Explain the terms chemisorption and desorption with reference to heterogeneous catalysis.

   (c) What are the various steps involved in the manufacture of Portland cement by rotary kiln technology? Explain the reactions taking place in different parts of the kiln.

   (d) What is 'annealing'? What special type of oven is used for the annealing of glass articles? Do you agree that the longer the annealing duration the more durable the glass article? Justify.   (3,2,5,5)

5. (a) What do you understand by 'glazing' of ceramic ware? What is the importance of glazing? Explain liquid glazing of ceramics.

   (b) Discuss the characteristics and applications of (i) safety glass (ii) photochromic glass.

   (c) What is a battery? What are the different types of batteries? Give examples.   (5,2½×2,5)

6.   (a) Briefly describe the formation, characteristics and applications of the following forms of carbon (any **two**) :

      (i) fullerenes

      (ii) nanotubes

      (iii) carbon fibre

  (b) What is the purpose of applying surface coatings to objects? Discuss the following methods of surface coating (any **two**) :

      (i) Anodisation

      (ii) Galvanisation

      (iii) Electroplating

  (c) What is the composition of Ziegler-Natta catalyst? Is it an example of homogeneous catalysis or heterogeneous catalysis? Illustrate its working cycle diagrammatically.

                                      ($2\frac{1}{2}\times2, 2\frac{1}{2}\times2, 5$)

08/12/17

Sr. No. of Question Paper : 6880   H C

Unique Paper Code   : 42224303

Name of the Paper   : Physics- III: Thermal Physics and
                             Statistical Mechanics (PHY-C3)

Name of the Course   : **B.Sc. (Prog.)**

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1.   Write your Roll No. on the top immediately on receipt of this question paper.

2.   Attempt **Five** questions in all.

3.   **Question No. 1** is compulsory.

4.   **All** questions are compulsory.

1.   Attempt any **five** of the following: (5×3=15)

   (a) State the Zeroth law of thermodynamics and explain its significance.

   (b) Derive the expression for work done during an adiabatic process.

(c) Why the melting point of some solids decreases with increase in pressure, while those of other solids increases. Explain this with the help of Clausius-Clapeyron Equation.

(d) Prove that entropy of an irreversible process always increases.

(e) How does the coefficient of viscosity change with temperature and pressure.

(f) Explain the spectrum of radiation emitted by a black body using appropriate diagram. Also give its significance.

(g) Define basic postulates of Statistical Mechanics.

2. (a) Derive the efficiency of Carnot's engine.

(b) A reversible engine converts 1/6th of the heat input into work. If the temperature of the sink is reduced to 335K its efficiency is doubled. Find the temperature of the source and of the sink. (10,5)

3. (a) State the second law of thermodynamics and prove the equivalence between Kelvin Planck and Clausius statements.

(b) Calculate the change in entropy when 10g of ice at $0°C$ changes in to steam at $100°$ C. (10,5)

4. (a) Explain the four thermodynamic potentials. Drive Maxwell's thermodynamic relations from them.

(b) Prove the following $C_p - C_v = -TE\alpha^2 V$. where T is absolute temperature, E is the modulus of isothermal elasticity, and α, is the coefficient of volume expansion.

(4,6,5)

5. (a) What is Joule– Thomson effect? Show that enthalpy remains constant during this process.

(b) Derive an expression for Joule–Thomson coefficient for an ideal gas and a real gas. (2,3,4,6)

6. (a) Derive Maxwell's velocity distribution law stating the assumption. Hence derive the probability of finding the number of molecules having momentum between p and $p + dp$.

(b) Prove that the root mean square speed of the gas molecule obtained on the basis of Maxwell's distribution law is $\sqrt{\dfrac{3kT}{m}}$. (10,5)

7. (a) Derive Planck's formula for the distribution of energy in the spectrum of a black body.

(b) Show that Wien's law and Rayleigh– Jean's laws are special cases of Planck's law. (10,5)

8. (a) Derive the relation S = klogW. Where S represent entropy, W is thermodynamic probability and k is Boltzmann constant.

(b) Starting from the basic assumption of Fermi Dirac Statistics show that $n_i = \dfrac{g_i}{e^\alpha e^{\mu_i/kT} + 1}$. Where symbol have usual meaning (5,10)

Sr. No. of Question Paper : 6885   **HC**

Unique Paper Code   : 42174304

Name of the Paper   : C-VIII, DSC-2C-Solutions, Phase Equilibria, Conductance Electrochemistry and Functional Group Organic Chemistry-II

Name of the Course   : **B.Sc. (Prog.)**

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Answer **six** questions in all, **three** questions from each section.

3. Use of scientific calculator is allowed.

SECTION A

Attempt 3 questions in all.

Question No. 1 is compulsory.

All questions carry equal marks.

P.T.O.

1. Explain any five:

   (a) A eutectic mixture has a definite composition and sharp melting point yet it is not a compound.

   (b) Equivalent conductance of a solution of electrolyte increases on dilution whereas the specific conductance decreases.

   (c) Addition of succinic acid in water phenol system decreases Critical Solution Temperature (CST)

   (d) All feasible electrochemical cells should have positive EMF values.

   (e) In phase diagram of water the fusion curve is inclined towards pressure axis.

   (f) Triple point is an invariant point.

   (g) Limitation of standard hydrogen electrode.

   (h) Difference between congruent and incongruent melting point.

   $(2½×5=12½)$

2. (a) Derive expression for EMF of concentration cell without transference.

   (b) Explain any two reference electrodes.

   (c) The EMF of the cell:

$$Ag \mid AgCl \text{ (s) } \mid KCl(aq) \mid Hg_2Cl_2(s) \mid Hg$$
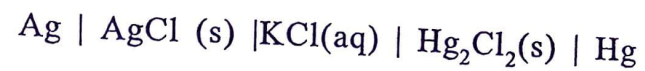
is 0.0455V at 298K and the temperature coefficient is $3.38 \times 10^{-4} VK^{-1}$. What is the reaction taking place in the cell and calculate free energy, enthalpy and entropy changes at 298 K.

$(4, 4, 4½)$

3. (a) Derive Gibbs phase rule.

   (b) Draw and discuss the well labelled phase diagram of lead-silver system **or** sulphur.

   (c) In water-phenol system, determine Phase, Component and Degree of Freedom:

   (i) inside the solubility curve

   (ii) outside the solubility curve

   (iii) at CST

   $(4,4,4½)$

4. (a) Define transference number and explain any one method to determine it.

   (b) Write short note on any two:

   (i) Ionic Mobility

   (ii) Nernst distribution Law

(iii) Conductometric Titration

(iv) Liquid junction potential

(c) If the molar conductance at infinite dilution of NaCl, HCl and CH_3COONa are 126,420 and 91 Scm^2mol^{-1} respectively, calculate molar conductance of acetic acid at infinite dilution.   (4, 4,4½)
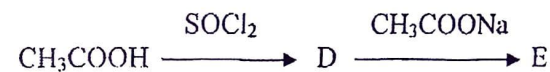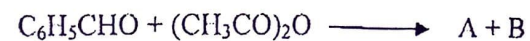
SECTION B

Attempt three questions in all.

All questions carry equal marks.

5. (a) Arrange the following acid derivatives in increasing order of their reactivity toward nucleophilic substitution reaction and support your order by suitable explanation:

$CH3CONH_3$, CH_3COCl_3, $CH_3COOCOCH$, $CH_3COOC_2H_5$

(b) Explain Hell-Volhard-Zelinsky reaction and give its synthetic applications?

(c) The alkaline hydrolysis of an ester is preferred than acidic hydrolysis to prepare carboxylic acid. Justify.

(d) Complete the following reactions and predict the structure of compounds A, B, C, D and E

$$C_6H_5CHO + (CH_3CO)_2O \longrightarrow A + B$$

$$BrCH_2COOC_2H_5 + CH_3COCH_3 \xrightarrow[\text{(ii) } H_2O]{\text{(i) Zn}} C$$

$$CH_3COOH \xrightarrow{SOCl_2} D \xrightarrow{CH_3COONa} E$$

     (3,3,1½,5)

6. (a) Give a detailed account of Hofmann elimination and compare it with Saytzeff elimination.

(b) Compare the basicity of aniline and ammonia.

(c) Write the reactions of primary aliphatic and aromatic amines with HNO_2.

(d) How benzene diazonium chloride can be converted to:

(i) Benzene

(ii) Phenol

(e) Outline the chemistry of Hinsberg test?   (3½,2,2,2,3)

7. (a) Explain Edman degradation method for the determination of N-terminal amino acid of peptide.

(b) Give the preparation of Glycine using Gabriel Phthalimide synthesis.

(c) What is DCC? Explain its usage in peptide synthesis with mechanism.   (6, 3½,3)

P.T.O.

8.　(a) Write the structures of products in the following reactions:

　　　(i) Glucose + Br_2/H_2O → A

　　　(ii) Glucose + Dilute HNO_3 → B

　　　(iii) Glucose + $PhNHNH_2$ (excess) → C

　　(b) Write short notes on the following:

　　　(i) Mutarotaion

　　　(ii) Ruff's Degradation

　　(c) How will you convert D-arabinose to D-glucose and D-mannose?

　　(d) Draw the Haworth projection for: α-D-glucopyranose and β-D-fructofuranose.　　　(3,5,2½,2)

Sr. No. of Question Paper : 6886   HC

Unique Paper Code   : 42174303

Name of the Paper   : Inorganic Materials [ICPT-303]

Name of the Course   : **B.Sc. (Prog.) Industrial Chemistry**

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **six** questions in all.

3. **Question No. 1** is compulsory.

1. (a) What are earthenware and stoneware?

    (b) Why is gypsum added in cement manufacturing?

    (c) Why are Plasticizers added in paint?

    (d) What is Sensitivity of an explosive?

    (e) What are superconducting and semi-conducting oxides?

                                          (5×3)

                                          P.T.O.

2. (a) Why is annealing important? How is it carried out?

(b) Give diagrammatic representation of the manufacture of glass.

(c) What are the important features of laminated and Borosilicate glass? (3×4)

3. (a) What is meant by paint failure ?

(b) Discuss Emulsions briefly.

(c) Define the term Catalyst Give suitable examples. (3×4)

4. (a) Give an account of manufacture of Nitrogeneous fertilizers with maximum nitrogen content.

(b) How does Ammonium sulphate act as a fertilizer?

(c) What are the essential requirements of a good fertilizer? (3×4)

5. (a) Discuss the process of the manufacture of ceramic products.

(b) What is Plasticity of clay?

(c) What are Calcareous and Argillaceous materials in cement? (3×4)

6. (a) What are propellants? How are they classified?

(b) How is TNT manufactured?

(c) Write one method to determine the power of an explosive. (3×4)

7. (a) What is a Phase Transfer Catalyst? Give one example.

(b) How is the activity of a catalyst determined?

(c) Differentiate between Physical and Chemical Adsorption. (3×4)

8. (a) Name the first real explosive. Who discovered it?

(b) Write a short note on Zeolites,

(c) Define the terms Hardening and Setting in Cement manufacturing with appropriate reactions. (3×4)

[This question paper contains 6 printed pages.]

Your Roll No....16/12/17

Sr. No. of Question Paper : 5012   H

Unique Paper Code   : 234361

Name of the Paper   : Computer System Architecture

Name of the Course   : **B.Sc. (Prog.)/B.Sc. Math. Sciences**

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question **1** is compulsory.

3. Attempt any **five** questions from Question Nos. **2** to **8**.

4. Parts of a questions are to be attempted together.

1. (a) Using Boolean Algebra, find the value of the expression $(A + B)'\ (A' + B')$. (2)

    (b) Simplify the following Boolean expression in sum-of-products form using K-maps.

       $F(A,B,C,D) = \Sigma(0,2,8,9,10,11,14,15)$ (3)

P.T.O.

(c) Convert the following with indicated bases

$(i) \ (89)_{10} = (...)_2$

$(ii) \ (653)_8 = (...)_{16}$

$(iii) \ (A6)_{16} = (...)_{10}$

$(iv) \ (138)_{10} = (...)_8$ (4)

(d) What are the two instructions needed in the basic computer in order to set the E flip flop to 1?   (2)

(e) Show how can a JK flip flop be converted to T flip flop.   (2)

(f) How many flip flops will be complemented in a 10 bit binary counter to reach the next count after 1001 1001 11?   (1)

(g) How many address and data lines are needed for memory unit of 64K X 8?   (2)

(h) Perform the arithmetic operations $(+70)_{10} + (-80)_{10}$ with binary equivalent numbers in signed 2's complement representation.   (3)

(i) Differentiate between positive and negative edge triggered flip flops.   (2)

(j) State the condition in which overflow occurs in case of addition & subtraction of two signed 2's complement number. How is it detected?   (2)

(k) Register A holds the 8 bit binary value 11011001. Determine the B operand and the logic micro-operation to be performed in order to change the value of A to :

    (i) 01101101

    (ii) 11111101   (2)

2. (a) Draw the circuit diagram for 4 bit bi-directional shift register with parallel load.   (5)

  (b) Construct a 16 X 1 line multiplexer with two 8 X 1 line multiplexers and one 2 X 1 line multiplexer. Use Block diagrams.   (5)

3. (a) Convert the numeric expression into reverse Polish notation and show the stack operations for evaluating the numeric result

    $(3 + 4) * [10 * (2 + 6) + 8]$ (5)

(b) Design a 4 bit combinational circuit decrementor using four full adder circuits. (5)

4. An instruction at address 065 in the basic computer has I = 0, op code = ADD, and address part as 099. The memory word ad address 099 contains the value B8F2 and the contents of AC is A937. Implement the instruction cycle and determine the contents of PC, AR, DR, AC, and IR registers. Repeat the above when opcode is AND. (5+5)

5. (a) Evaluate the arithmetic statement X = (A+B)*(C+D) using a general register computer with three address and one address instruction format. (7)

(b) A digital computer has a common bus system for 16 register of 32 bits each. The bus is constructed with multiplexers.

(i) How many selection inputs are there in each multiplexer?

(ii) How many multiplexers and of what size are there in the bus? (3)

6. (a) What is an Interrupt cycle? Explain using flow chart. (5)

(b) An instruction is stored at location 300 with its address field at location 301. The address field at location 301. The address field has the value 400. A processor register R1 contains the number 200. Evaluate the effective address if the addressing mode of the instruction is

(i) Direct

(ii) Immediate·

(iii) Relative

(iv) Register indirect

(v) Index with R1 as the index register (5)

7. (a) Design a combinational circuit with three inputs x, y, z and three outputs A, B, C. When the binary input is 0. 1, 2 or 3, the binary output is one greater than the input. When the binary input is 4, 5, 6 or 7, the binary output is one less than the input. (6)

(b) What are three-state bus buffers? How are they used to implement bus? (4)

8. Distinguish between the following : (10)

   (a) Isolated and Memory Mapped I/O

   (b) Direct and Indirect Addressing

   (c) Serial and Parallel Transfer

   (d) RISC and CISC architectures

[This question paper contains 4 printed pages.]

Your Roll No...............

Sr. No. of Question Paper : **5014**   **H**

Unique Paper Code   : 235366

Name of the Paper   : MAPT – 303 : Algebra

Name of the Course   : **B.Sc. Physical Sciences / B.Sc. Mathematical Sciences**

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt any **two** parts of each question.

3. **All** questions are compulsory.

4. Marks are indicated.

UNIT – I

1. (a) Prove that the set of all 2×2 matrices with entries from real numbers and determinant +1 is a non abelian group. (6)

P.T.O.

(b) (i) Prove that if $(ab)^2 = a^2b^2$ in a group G then $ab = ba$.

     (ii) Construct a Cayley table for U(12).   (6)

(c) Prove that the set $\{1,2,3,\ldots\ldots\ldots, n-1\}$ is an abelian group under multiplication modulo n if and only if n is prime.   (6)

2. (a) Explain the group of symmetries of an Equilateral triangle.   (6)

(b) Show that the centralizer of a group is a subgroup of a group.   (6)

(c) (i) List the elements of the subgroups $\langle 3 \rangle$ and $\langle 7 \rangle$ in U(20).

     (ii) Find the generators of Z_6 and Z_8.   (6)

3. (a) Determine whether the following permutations are even or odd.

     (i) $(1\ 3\ 5\ 6)$

     (ii) $(1\ 2)\ (1\ 3\ 4)\ (1\ 5\ 2)$ (6)

(b) State Lagrange's theorem. Is converse of Lagrange's theorem true? Justify with appropriate examples.   (6)

(c) (i) Show that a group of prime order is cyclic.

     (ii) Let $G = \langle a \rangle$ such that $|a| = 15$. Let $H = \langle a^5 \rangle$ be a subgroup of G. Find all distinct right cosets of H in G.   (6)

UNIT – II

4. (a) Prove that every field is an integral domain.   (6½)

(b) Let $M_2(Z)$ be the ring of all 2×2 matrices over integers and

$$\text{let } R = \left\{ \begin{bmatrix} a & a-b \\ a-b & b \end{bmatrix} \Big| \, a, b \in Z \right\}$$

Prove or disprove that R is a subring.   (6½)

(c) (i) Define an Integral domain.

     (ii) Show that every non zero element of Z_n is either a unit or a zero divisor.   (6½)

UNIT – III

5. (a) (i) Define basis of a vector space.

     (ii) If $\{v_1, v_2, \ldots\ldots v_n\}$ is a basis of a vector space V(F) then prove that every element of V can be

uniquely expressed as a linear combination of $v_1, v_2 \dots\dots\dots v_n$. (6½)

(b) Let $V = R^3$ and $W = \{(a, b, c) \in V : ab = 0\}$. Is W a subspace of V? (6½)

(c) If the vectors $u = (0, 1, a)$, $v = (1, a, 1)$, and $w = (a, 1, 0)$ are linearly dependent in $R^3(R)$, find a. (6½)

6. (a) Show that $T: R^2 \to R^2$ be a linear transformation such that

$$T(1,1) = (1,3), \quad T(-1,1) = (3,1)$$

Find $T(a, b)$ for any $(a, b) \in R^2$ (6½)

(b) Let $T: R^3 \to R^3$ be a linear transformation defined as

$$T(x, y) = (x + y, x - y, y)$$

Find KerT, RangeT, RankT and NullityT. (6½)

(c) Let T be a linear operator on R^3, the matrix of which in the standard ordered basis is

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

Describe explicitly $T: R^3 \to R^3$. (6½)

Sl. No. of Ques. Paper: **5055**   **H**

Unique Paper Code   : **216351**

Name of Paper   : **Biodiversity I – Microbes (LSPT-304)**

Name of Course   : **B.Sc. (Life Sciences)**

Semester   : **III**

Duration   : **3 hours**

Maximum Marks   : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all.
Question No. 1 is compulsory.
All parts of a question should be answered together.
Draw well labelled diagrams wherever necessary.
All questions carry equal marks.

1. (a) Fill in the blanks (any *ten*):

    (i)   .... is a virus having RNA genome.

    (ii) Protein coat of virus is known as ... .

    (iii) In .... bacteria flagellae are present over the entire surface.

    (iv) Citrus canker is caused by .... .

    (v)   Red colour of the snow is due to the alga ... .

    (vi) Arbuscules and vesicles are present in ... .

    (vii) Plasmodium is formed in ... .   P. T. O.

(viii) Button-stage is present in the fungus ... .

(ix) Air Bladders are found in the alga ... .

(x) Heterocyst is present in the genus ... .

(xi) Genus .... produces beaked, pigmented, muriform and multicellular conidia.

(xii) Cephalodia are present in .... .   1×10=10

(b) Match the following:—

(i)	Phialapore	(A)	Uredospores
(ii)	*Puccinia*	(B)	Diatoms
(iii)	Silica	(C)	Zygospore
(iv)	*Nostoc*	(D)	*Volvox*
(v)	*Rhizopus*	(E)	Akinetes

1×5

2. Write notes on any *three* of the following:

(a) Tobacco Mosaic Virus

(b) Asexual reproduction in *Volvox*

(c) Ecological and economic importance of lichens

(d) Lysogenic cycle

(e) Asexual reproduction in *Albugo*.   3×5=15

3. Draw well-labelled diagrams of any *three* of the following:

(a) T$_4$ Bacteriophage

(b) E.M. Bacterium

(c) W.M. Cystocarp of Polysiphonia

(d) V.S. of heteromerous lichen thallus

(e) Asexual reproduction in *Penicillium*.   3×5=15

4. Differentiate between any *three* of the following:

(a) Transformation and Transduction

(b) Gram +ve and Gram -ve bacteria

(c) Macrandrous and Nannandrous species of *Oedogonium*

(d) Aphanoplasmodium and Phaneroplasmodium

(e) Foliose and Fructicose Lichens.   3×5=15

5. (a) Discuss the sexual reproduction in *Rhizopus*.   5

(b) Write an explanatory note on conjugation in bacteria.   5

(c) Mention the causal organism and symptoms of Early Blight of Potato and its control measures.   5

6. (a) Write explanatory note on Dermatophytic fungi.   5

(b) Explain the post-fertilization changes in *Polysiphonia*.   5

(c) Write economic importance of bacteria.   5

7. (a) Discuss the causal organism, symptoms, disease

cycle and control measures of black stem rust of wheat. 9

(b) Discuss various methods of sexual reproduction in *Chlamydomonas*. 6

[This question paper contains 4 printed pages.]

Your Roll No...........

Sr. No. of Question Paper : 5058   H

Unique Paper Code   : 222363

Name of the Paper   : PHPT-303 : Waves and Optics

Name of the Course   : **B.Sc. Physical Science**

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt any **five** questions.

1. (a) Describe Lissajous Figures. (3)

(b) Represent graphically the form of the Lissajous Figure traced out by a particle subjected to two perpendicular simple harmonic motions of unequal amplitudes, frequencies in the ratio 1:2 and phases differing by (i) 0 and (ii) n/4 respectively. (12)

P.T.O.

2. (a) Establish the equation of motion limit of a damped harmonic oscillator. If the damping is less than critical, show that the motion of the system is oscillatory with its amplitude decaying exponentially with time. (9)

(b) Define and write an expression for logarithmic decrement, relaxation time and quality factor of a weakly damped oscillator. (6)

3. (a) What are normal coordinates and normal modes? Explain their significance. (5)

(b) Find the normal mode frequencies and normal mode shapes of the following system executing longitudinal vibrations.
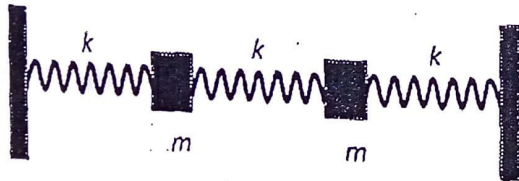
(10)

4. (a) Using the principle of superposition, derive the expression for standing waves formed in a string of length L bounded at the two ends. Also write the expression for normal mode frequencies of the modes and draw the shapes of first two normal modes. (12)

(b) What are stationary waves? Why are they called so? (3)

5. (a) Explain the formation of Newton's rings and derive an expression for the diameter of dark rings formed by reflected light. (10)

(b) In a Newton's ring experiment, the diameter of the 10th ring changes from 1.40 cm to 1.27 cm when a liquid is introduced between the lens and the plate. Calculate the refractive index of the liquid. (5)

6. (a) Discuss the intensity distribution of Fraunhofer diffraction pattern obtained with a narrow slit illuminated by a parallel beam of monochromatic light. (10)

(b) Light of wavelength 6000A° is incident on a slit of width 0.30 mm. The screen is placed at a distance of 2 m from the slit. Find the distance between the first minima and the central maximum. (5)

7. (a) Explain the construction and working of a zone plate. Derive an expression for the focal length of a zone plate. Explain how it acts as a converging lens having multiple foci. (12)

(b) What are the similarities and dissimilarities between a zone plate and a converging lens? (3)

8. (a) Explain Rayleigh's criterion of resolution of wavelength.

(5)

(b) Derive an expression for resolving power of a grating.

(5)

(c) What is double refraction and how is it used to obtain polarised light?

(5)