

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

1. Write a note on violation of rights of minorities. What are the Constitutional provisions for the protection of Human Rights ? [15]

OR

1. Explain the National Human Rights Commission. What are the functions of National Commission for women ?

2. Write a note on different types of pollution. Explain threats to the environment arising from pollution. [15]

OR

2. Explain the factors to be considered in prevention of disaster ? Write a note on discrimination in relief distribution.

3. Explain the significance of observation and experimentation. Explain the role of science in exploding myths. [15]

OR

3. Explain principles and characteristics of science. Explain the development of science in ancient culture.

4. Explain the importance of effective listening. What are the advantages of oral communication ? [15]

Or

4. Write a note on body language. What are the characteristics of effective leadership ?

5. Write a note on food security and nutrition. Explain the importance of healthy environment and working conditions.

OR

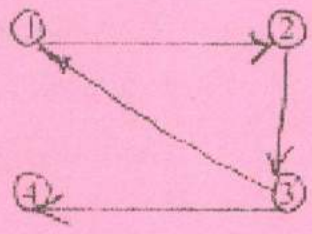
5. **Write short notes on (any five):** [15]

- Right to education.
- Determinants of Health.
- Safe drinking water and sanitation.
- Availability of health care and medical services.
- Right to health.
- Human rights violations of women.
- Human rights violations of children.

- Note: (1) Attempt the following Questions.  
 (2) Assume suitable data wherever necessary.  
 (3) Draw diagram/sketch wherever necessary.  
 (4) Each question carry 10 marks

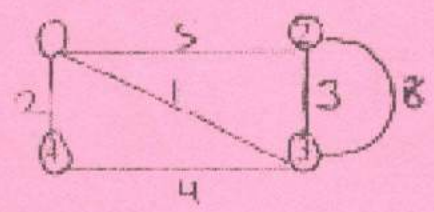
**Q1) Attempt the following: (Any 2)**

- a) In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?
- b) Let  $A=\{1,2,3,4\}$  and  $R=\{(1,2),(2,1),(2,3),(3,4)\}$ . Find the transitive closure by Warshall's algorithm.
- c) Use the generating function to solve the recurrence relation  $a_n=3a_{n-1}+2, n \geq 1$  with  $a_0=1$ .
- d) Explain the Required transitive closure of the given directed graph by warshal Algorithm



**Q2) Attempt the following :(Any 2)**

- a) Use the generating function to solve the recurrence relation  $a_n=a_{n-1}+2, a_1=1$  where  $n > 1$
- b) How many integers from 1 to 50 are only multiples of 2 or 3?. Explain with the help of Inclusion Exclusion Principle?
- c) Write an algorithm to insert a vertex in binary search tree.
- b) Describe the Warshal Algorithm to calculate the shortest distance between vertices.



**Q3) Attempt the following: (Any 2)**

- a) Draw the Hasse diagram of the following sets under partial order relation "divides" and indicate those which are chains. { 1,3,9,18}
- b) Let  $L = \{1,2,3,6\}$  and  $R$  be the relation 'is divisible by'. Prove that  $L$  is a Lattice.
- a) Explain the Pigeonhole Principle.
- b) From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?

**Q4) Attempt the following:**

- a) Explain Turing Machine. (8 M)
- b) What would be language generated by the following grammar - (7 M)

$G: N = \{S, A, B\} T = \{a, b\} P = \{S \rightarrow AB, A \rightarrow aA|a, B \rightarrow bB|b\}$

OR

- c) Form a binary search tree for the words mathematics, physics, geography, zoology, meteorology, geology, psychology, chemistry (using alphabetical order) (8M)
- d) State the Graphical representation of Deterministic Finite Automata. Let the given deterministic finite automaton be  $\rightarrow$  (7 M)

- $Q = \{a, b, c\},$

- $\Sigma = \{0,1\}$

- $q_0 = \{a\},$

- $F = \{c\}.$

(5 M)

=====

S.Y.B.Sc Regular exam / Sem-III / Sub: Comp Sci - II

SAR-315

161017

Hrs: 2½

MM : 75

(75:25)

INSTRUCTIONS:

1. All Questions are compulsory.
2. Make suitable assumptions wherever necessary.
3. Write in neat and legible handwriting.
4. Draw diagram wherever necessary.
5. Mixing of sub questions is not allowed.

**Q.1 Answer of the following ANY TWO:**

[20]

- A. What is use case diagram? Explain with example.
- B. What is Sequence Diagram? Explain with example.
- C. What is Activity Diagram? Explain with example.
- D. Explain the following terms:
  - 1) Association
  - 2) Dependency
  - 3) Composition
  - 4) Join
  - 5) Unified Process

**Q.2 Answer of the following ANY TWO:**

[20]

1. Explain Communication diagram in details.
2. Explain activity diagram in detail.
3. Explain how an Object is created and destroy in Python Programming.
4. How a user defines method is implemented in Python Programming? Explain with example.

**Q.3 Answer of the following ANY TWO:**

[20]

1. Explain State Change Diagram with example.
2. Explain events and signals with example.
3. Explain state machines with example.
4. Explain processes and Threads with example.

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

[15]

1. Differentiate between Imperative and object-oriented programming? (8)  
OR  
Explain the basic principles of oops in python? (8)
2. Explain Encapsulation and Abstraction in OOP. (7)  
OR  
Explain Multi Level Inheritance with example? (7)

=====

(75!25)

S.Y.B.Sc Regular exam / Sem - III / Sub Comp Sci - III

SSR-317                      161018                      Hrs: 2½                      MM : 75

Note: 1. All questions are compulsory.  
2. Mixing the sub questions is not allowed.

1. Answer the following: (Any Two) [20]

- a) Explain Stack with example. Write code for push() operation.
- b) List the names of problem solving approach? Give three examples of each.
- c) Explain any one asymptotic notation with example.
- d) Explain time complexity of an algorithm.

2. Answer the following: (Any Two) [20]

- a) Explain Binary Tree with example.
- b) Write a program to sort the data of a list.
- c) Write code snippet to traverse a tree in pretorder.
- d) What operations can be performed on Queue?

3. Answer the following: (Any Two) [20]

- a) Draw a directed graph with five vertices and seven edges.
- b) What do you mean by Map?
- c) Explain any one traversal in graph.
- d) What is hashing?

4. Answer the following: (Any Two) [15]

- a) Write program to print time complexity of Fibonacci series. (8)

OR

Briefly explain the dynamic programming approach to develop algorithms. (8)

- b) Explain adjacency list and adjacency matrix representation of graph. (7)

OR

What is Data structure? Differentiate liner from nonlinear data structure. (7)

=====

SSR-301

161006

Hrs: 2½

MM : 75

Note: (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

**Q(1) Part A: Attempt any ONE questions.****(08 marks)**

- (a) State and prove Riemann's Criterion for integrability.
- (b) Show that if  $f$  and  $g$  are integrable on  $[a, b]$  then  $f + g$  is also integrable on  $[a, b]$  and

$$\int_a^b f + g = \int_a^b f + \int_a^b g$$

**Part B: Attempt any THREE questions.****(12 marks)**

- (c) If  $f: I \rightarrow \mathbb{R}$  is bounded and  $P$  is any partition of  $I$ , show that  $L(P, f) \leq U(P, f)$ .
- (d) Show that  $f: [0, 1] \rightarrow \mathbb{R}$  defined by  $f(x) = x$  is integrable and  $\int_a^b f = \frac{1}{2}$
- (e) Show that if  $f$  and  $g$  are by  $f(x) = x$  is integrable on  $I$  and  $f(x) \geq g(x)$  for all  $x$  in  $I$  then

$$\int_a^b f \geq \int_a^b g$$

- (f) Let  $P = [0, \frac{1}{3}, \frac{2}{3}, 1]$  be a partition of  $I = [0, 1]$ . If  $f(x) = 3x$ , find the value of  $L(P, f)$  and  $U(P, f)$ .

**Q(2) Part A: Attempt any ONE questions.****(08 marks)**

- (a) State and prove the Fundamental theorem of calculus (Differentiable form).
- (b) Show that  $\int_0^1 x^{m-1}(1-x)^{n-1} dx$  exists iff  $m$  and  $n$  are positive.

**Part B: Attempt any THREE questions.****(12 marks)**

- (c) Discuss the convergence of

$$(i) \int_1^\infty \frac{e^{-\sqrt{x}}}{\sqrt{x}} dx \text{ and } (ii) \int_1^3 \frac{xdx}{\sqrt{x^2-1}}$$

(d) Prove that  $\beta(m, n) = \beta(m + 1, n) + \beta(m, n + 1)$

(e) Show that  $\int_0^\infty x^{5/2} e^{-x^7} dx = \frac{\sqrt{\pi}}{7}$

(f) Show that  $\Gamma^{-1}\left(\frac{1}{2}\right) = \sqrt{\pi}$

**Q(3) Part A: Attempt any ONE questions.**

**(08 marks)**

(a) State Fubini's theorem for double integrals. Hence verify this theorem for the integral

$$\int_0^2 \int_0^1 (xy - 3y^2) dx dy$$

(b) Find the centre of mass of a thin triangular plate bounded by the  $y$ -axis and the lines  $y = x$  and  $y = 2 - x$  if the density function is  $6x + 3y + 3$ .

**Part B: Attempt any THREE questions.**

**(12 marks)**

(c) Find the area of the region bounded by the curves  $x = y^2$  and  $x = 2y - y^2$

(d) Evaluate the double integral  $\int_0^2 \int_0^{x^2} x(x^2 + y^2) dy dx$ .

(e) Find the spherical coordinates equation for the sphere  $x^2 + y^2 + (z - 2)^2 = 1$ .

(f) Find the moment of thin rectangular plate about  $y$ -axis bounded by  $x = 6$  and  $y = 1$ , if  $\delta(x, y) = x + y + 1$ .

**Q(4) Attempt any three questions from the following.**

**(15 marks)**

(a) If  $f$  is integrable on  $[a, b]$  then show that  $\left| \int_a^b f \right| \leq \int_a^b |f|$ .

(b) Show that if  $f$  is monotonic on  $[a, b]$  then  $f$  is integrable on  $[a, b]$ .

(c) State and prove integrable by parts formula.

(d) Prove that  $\beta(m, n) = 2 \int_0^{\pi/2} \sin^{2m-1} \theta \cos^{2n-1} \theta d\theta$ .

(e) Graph  $f(x, y, z) = 256 - x^2 - y^2 - z^2$  and plot the level curves for  $c = 0$ ;  $c = -144$ ;  $c = 87$ .

(f) Evaluate  $\iint_D (3x + 4y) dx dy$

Where  $D = \{(x, y): -1 \leq x \leq 1; 2x^2 \leq y \leq 1 + x^2\}$

=====

- Note: (1) All questions are compulsory.  
 (2) Figures to the right indicate full marks.  
 (3) Use of calculator is not allowed.

**Q1A. Attempt any one.** (8)

- (i) Let  $V, W$  be real vector spaces. If  $T: V \rightarrow W$  is a linear isomorphism, prove that  $T^{-1}: W \rightarrow V$  is a linear isomorphism.  
 (ii) Let  $T: V \rightarrow W$  be a linear map where  $V$  and  $W$  are real vector spaces. Prove that  $T$  is an isomorphism *iff*  $\{T(v_i)\}$  is a basis of  $W$  for any basis  $\{v_i\}_{i=1}^n$  of  $V$ .

**B. Attempt any three.** (12)

- (i) Find the rank of a matrix  $A = \begin{pmatrix} 1 & -3 & 1 & 1 \\ 2 & 1 & -1 & 2 \\ 1 & 4 & -2 & 1 \\ 5 & -8 & 2 & 5 \end{pmatrix}$   
 (ii) Verify whether the linear map  $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$  defined as  $T(x, y, z) = (x + z, y + z, x + y)$  is an isomorphism. Find the inverse linear isomorphism if it exists.  
 (iii) Discuss the consistency of the following system of equations and find the solution set if it exists.

$$2x_1 - 3x_2 - 7x_3 + 5x_4 + 2x_5 = -2$$

$$x_1 - 2x_2 - 4x_3 + 3x_4 + x_5 = -2$$

$$2x_1 - 4x_3 + 2x_4 + x_5 = 3$$

$$x_1 - 5x_2 - 7x_3 + 6x_4 + 2x_5 = -7$$

- (iv) Verify Rank. Nullity theorem for the linear map  $T: \mathbb{R}^4 \rightarrow \mathbb{R}^3$  defined as  $T(x, y, z, w) = (x + y, z + 2y, z - w)$

**Q2A. Attempt any one.** (8)

- (i) Using standard basic properties of determinants, prove that,  
 (a) for any  $i \neq j$  and  $\alpha \in \mathbb{R}$   
 $\det(V_1, \dots, V_i, \dots, V_j + \alpha V_i, \dots, V_j, \dots, V_n) = -\det(V_1, \dots, V_j + \alpha V_j, \dots, V_j, \dots, V_n)$   
 (b)  $\det(V_1, \dots, V_i, \dots, V_j, \dots, V_i, \dots, V_n) = -\det(V_1, \dots, V_j, \dots, V_i, \dots, V_n)$   
 (ii) Let  $A \in \mathbb{R} (n \times n)$  Prove that,

- (a)  $A$  is invertible if and only if the columns for any  $A_i$  of  $A$  are linearly independent.  
 (b)  $\det A = 0$  if and only if  $A_i$  are linearly dependent.

**B. Attempt any three.** (12)

- (i) Using standard basis vectors of  $\mathbb{R}^3$ , Evaluate the determinant

$$\begin{vmatrix} 2 & 1 & 0 & 4 \\ 0 & -1 & 3 & 2 \\ 1 & -1 & 2 & 0 \\ 0 & 1 & 0 & 1 \end{vmatrix}$$



- (ii) Evaluate the following determinant using Laplace expansion method with first column & 2<sup>nd</sup> row respectively

$$\begin{vmatrix} 4 & 1 & 5 & 0 \\ 1 & 2 & 1 & 1 \\ 3 & 1 & 2 & 4 \\ 1 & 5 & 1 & 2 \end{vmatrix}$$

- (iii) Solve the following equations using Cramer's rule.

$$x + y + z = 0$$

$$x - 2y + 3z = 0$$

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

- (iv) Prove that,  $\det(AB) = \det A \cdot \det B$  where  $A, B \in M_n(\mathbb{R})$

**Q3A. Attempt any one.**

(8)

- (i) State and prove triangle inequality for a real inner product space  $V$ . Also prove that for any  $x, y \in V$

$$||x|| - ||y|| \leq ||x - y||$$

- (ii) State and prove Cauchy Schwarz inequality.

**B. Attempt any three.**

(12)

- (i) Find an orthonormal basis for the space of solutions of the equations  $2x + y - z = 0$
- (ii) Using Gram Schmidt method, find an orthonormal basis for the subspace of  $\mathbb{R}^3$  generated by the vectors  $(1,1,1)$ ,  $(1,0,3)$  &  $(1,2,3)$  in  $\mathbb{R}^3$ .
- (iii) Find the angle between the vectors  $(1,0,0)$  and  $(1,1,1)$  in  $\mathbb{R}^3$  with usual inner product.
- (iv) Prove that the vector space  $\mathbb{R}^2$  with the product defined as  $\langle x, y \rangle = y_1(2x_1 + 2x_2) + y_2(x_1 + x_2)$  is an inner product space where  $x = (x_1, x_2)$  &  $y = (y_1, y_2)$ .

**Q4. Attempt any three.**

(15)

- (i) Let  $T: V \rightarrow W$  be a linear map. Prove that
- (a)  $\text{Ker } T$  is a subspace of  $V$ .
- (b)  $\text{Im}(T)$  is a subspace of  $W$ .
- (ii) State and prove Rank-Nullity theorem.
- (iii) Show that, for any  $A \in M_2(\mathbb{R})$ ,  $\det(\text{Adj } A) = (\det A)^{n-1}$ ,  $A$  is non-singular matrix.
- (iv) For any fixed basis  $\{e_1, e_2, \dots, e_n\}$  of a real vector space  $V$ , prove that, there exists a unique function  $g: V \times V \rightarrow \mathbb{R}$  such that
- (a)  $g$  is  $n$ -linear (b)  $g$  is skew symmetric,
- (c)  $g(e_1, e_2, \dots, e_n) = 1$
- (v) State and prove Pythagoras theorem for a real inner product space.
- (vi) State and prove that triangle inequality for the vectors in a real inner product space.

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

**Q1a. Attempt any one question.**

- (i) To prove that set of real number is uncountable. (08)

OR

- (ii) To prove that if  $1 \leq K \leq p - 1$  then  
 $S(p, k) = k (S(p - 1, K) + S(p - 1, K - 1))$  (08)

**Q1b. Attempt any three questions.**

- (i) Find  $S(4,2)$  by writing all the partitions of the set  $\{1,2,3,4\}$  into two parts. (04)  
 (ii) Find the number of people having birthdays in the same month  
 (i) Among thirteen people (04)  
 (ii) Among two hundred people. (04)  
 (iii) Calculate  $S(5,2)$  using stirling formula of second kind. (04)  
 (iv) If A and B are non empty finite set and A and B are disjoint (ie  $A \cup B = \emptyset$ ) then prove that  
 $|A \cup B| = |A| + |B|$  (04)

**Q2a. Attempt any one question.**

- (i) State and prove that Binomial theorem. (08)

OR

- (ii) Let  $A_1, A_2, \dots, A_n$  be finite set. Then prove that

$$|A_1 \cup A_2 \cup \dots \cup A_n| = \sum_{1 \leq i \leq n} |A_i| - \sum_{1 \leq i < j \leq n} |A_i \cap A_j| + \sum_{1 \leq i < j < k \leq n} |A_i \cap A_j \cap A_k| - \dots + (-1)^{n+1} |A_1 \cap A_2 \cap \dots \cap A_n|$$

(08)

**Q2b. Attempt any three question**

- (i) When  $(2x_2 - 3x_2 + 5x_2)$  is expanded find the coefficient of  $x_1^3 x_2 x_3^2$  (04)  
 (ii) A bakery has 8 varieties of doughnuts, If a box of doughnuts contain 1 dozen, how many different option are there for a box of doughnuts. (04)  
 (iii) Determine the number of positive integer n when  $1 \leq n \leq 1000$  & n is not divisible by 2, 3, & 5. (04)  
 (iv) At a party 8 gentlemen check their hats when they return in how many ways.

- (i) No gentleman receive his own hat.  
(ii) Atleast one of the gentleman receive his own hat. (04)

**Q3a. Attempt any one question**

- (i) Let  $S_n$  be the set of permutation of  $M_n$  then  $|S_n| = x^{-1}$  (08)

OR

- (ii) Explain with help of examples  
(1) Linear Recurrence Relation  
(2) Linear Homogenous Recurrence Relation

**Q3b. Answer any three questions.**

- (i) Define Transposition.  
Check whether the given permutation is a cycle, Give the lengh of the cycle (04)

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

- (ii) Determine whether the permutation are even or odd

(1)  $P_1 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 7 & 3 & 4 & 2 & 1 & 8 & 6 & 5 \end{pmatrix}$

(2)  $P_2 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 3 & 4 & 1 & 7 & 5 & 8 & 5 \end{pmatrix}$

- (iii) Let  $A = \{1,2,3\}$  find (1) Identify permutation if  $P_3 = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 1 & 2 \end{pmatrix}$  &  $P_4 = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{pmatrix}$

Then find (2)  $P_3^{-1}$  (3)  $P_4^{-1}$  (4)  $P_3^0 P_4$

- (iv) Give first four terms for the given relation as linear homogenous and find its degree.

$a_n = 4.5 a_{n-1} \quad a_1 = 5$

**Q4. Attempt any three questions.**

- (a) State and prove multiplication principle. (05)  
(b) How many odd numbers between 1000 and 9999 have distinct digit. (05)  
(c) Ten people including two who do not wish to sit next to one another are to be seated at a round table. How many circular seating arrangements are there? (05)  
(d) Make the Pascal triangle for  $n = 6, k = 0,1,2,3,4,5,6$ .  
(e) Write a short note on signature of permutation and explain how it can be calculated. (05)  
(f) Let  $A_1 = \{a_1, a_2, \dots, a_n\}$  be a finite set with  $n$  element  $n > 2$ , there are  $n!/2$  even permutation and  $n!/2$  odd permutation. (Prove this statement). (05)

(75:25)

# S.Y.B.Sc Regular (Sub: Chemistry)

SSR-302	161006	Hrs: 2 1/2	MM : 75
---------	--------	------------	---------

- Note: 1. Figures to the right indicate full marks.  
2. non-programmable calculators are allowed to use.

**Q. 1 Attempt any Four (20)**

- 1) Derive the Gibbs-Duhem equation.
- 2) Give a thermodynamic derivation of the law of mass action.
- 3) Derive the expression for Van't Hoff reaction isochore.
- 4) Half-time of 1st order reaction is 60 min at 27°C and it becomes 30 min at 127°C. Find the energy of activation.
- 5) Explain Arrhenius theory of reaction rate with the help of energy diagram.
- 6) If the vapour pressures of water at 95°C and 100°C are 634 and 760 mm respectively. Calculate the latent heat of vapourisation per mole.
- 7) If the value of Planck's constant is 6.626 x 10<sup>-34</sup> J s, calculate the wave-length of the light.
- 8) How is the quantum yield determined experimentally?

**Q. 2 Attempt any Four (20)**

1. Define conductance, specific conductance and equivalent conductance.
2. A 2 x 10<sup>2</sup> mol dm<sup>-3</sup> solution of NaCl has a specific conductance of 3.056 x 10<sup>-1</sup> S m<sup>-1</sup>. Calculate its molar conductance and equivalent conductance.
3. Explain the titration of dibasic acid against strong base.
4. Calculate the pH at the points - i) initial, ii) after adding 12.5 cm<sup>3</sup> of HCl and after adding 25 cm<sup>3</sup> of HCl, when 25 cm<sup>3</sup> of 0.1 M BOH (K<sub>b</sub> = 1 x 10<sup>-7</sup>) is titrated against 0.1 M HCl (K<sub>a</sub> = 6.6 x 10<sup>-4</sup>).
5. How does the presence of ionic atmosphere retard the velocity of an ion in solution?
6. The specific conductance of a saturated solution of AgCl at 298K is 0.000337 S m<sup>-1</sup>, whereas that of distilled water is 0.0002 S m<sup>-1</sup>. The limiting conductance values for KCl, AgNO<sub>3</sub> and KNO<sub>3</sub> are 0.0142, 0.0125 and 0.0130 respectively. Calculate the solubility of AgCl.
7. Sketch the titration curve for strong base - weak acid and indicate suitable indicators.
8. Explain the titration of monobasic acid against strong base.

**Q.3 Attempt any Four**

(20)

1. The distribution ratio  $D$  is 10 in favour of organic solvent for a particular system. Calculate the % extraction for a volume ratio  $V_0/V_w$  of (i) 1 and (ii) 10 for a single extraction.
2. 90% of an organic substance is extracted from its aqueous solution by using equal volumes of aqueous and organic solvents in single extraction. What will be the percentage extraction if the quantity of organic solvent is doubled?
3. State Nernst's distribution law and causes of deviation there from
4. What are metallochrome indicators? Explain the conditions to be fulfilled by a substance to be used as metallochrome indicator
5. Describe batch extraction method.
6. State Nernst's distribution law and causes of deviation there from
7. EDTA is a good titrant for estimating metal ions. Explain.
8. Discuss the different methods adopted to increase the selectivity of EDTA.

**Q.4A) State the following statement is True or False**

(10)

1. Extensive property of the system is the property that depends on temperature, pressure, moles of different components.
2. Variation of equilibrium constant with temperature at constant volume is given by Van't Hoff reaction isochors.
3. For a spontaneous process,  $\Delta G$  of a process is always less than zero.
4. The energy of an Einstein of radiation of wavelength 400 nm is less than that of radiation of 300 nm. The light emitted in a chemiluminescent reaction is also called as cold light.
5. The increase in the rate of reaction with temperature is due to increase in the number of molecules having energy of activation.
6. At infinite dilution of an electrolyte, the equivalent conductances of cations and anions are independent of each other.
7. Each ion in a solution is surrounded by ions of opposite charge.
8. Any weak acid can be satisfactorily titrated against a strong base
9. The analyte must always be the titrand.

B) Fill in the blanks—

(05)

1. The emission of light as a result of chemical reaction is called.....  
a) phosphorescence; b) fluorescence; c) chemiluminescence; d) photon
2. The energy per Einstein depend upon the wavelength of photon. The higher the wavelength, the.....will be the energy per Einstein.  
a) higher; b) lower; c) smaller; d) same
3. For a reaction that obeys Einstein law  
a)  $\phi = 1$ ; b)  $\phi < 1$ ; c)  $\phi > 1$ ; d)  $\phi = 0$
4. The ..... of a strong electrolyte varies linearly with square root of concentration.  
a) molar conductance b) equivalent conductance; c) conductance d) none
5. EDTA is a ..... dentate ligand,  
a) di; b) bi; c) tri; d) hexa

=====

Note: 1. All questions are compulsory. *Chemistry (75:25)*  
2. ~~Non-programmable calculators are allowed to use.~~ *P2*

**Q.1 ATTEMPT ANY FOUR****5 marks each**

1. How is borazine synthesized. Why is it called inorganic benzene
2. What are silicones? How are they synthesized by using silicon tetrachloride.
3. On basis of the VBT explain the formation and geometry of the following molecules  
a) boron trifluoride b) phosphorus pentafluoride
4. On the basis of the MOT explain the formation of the OXYGEN molecule
5. Define hybridization. List the postulates on which the VBT is based.
6. Define LATTICE ENERGY. What are the factors affecting lattice energy.
7. Draw a MO diagram of the CO molecule and calculate its bond order.
8. a) Explain sp hybridization with one example.  
b) Explain sigma bond formation. Why is it stronger than the pi bond

**Q.2. ATTEMPT ANY FOUR****5 marks each.**

1. How is phenol prepared from cumene. Convert phenol to  
a) ester b) methoxy benzene
2. Explain the following with respect to phenol  
a. acetylation reaction. b. Williamson,s synthesis
3. Write the halogenation reactions of METHYL BENZENE in presence and absence of sunlight. Name the products formed.
4. Write the atomic number and the outer electronic configuration of the following d-block elements  
a. Fe b. Sc c. Cu.
5. (a) Draw the structure of  
i) p-dinitrobenzene  
ii) o- nitroaniline  
(b) Write the reaction showing the conversion of benzene to nitrobenzene. What is the action of Sn/HCl on nitrobenzene. Name the products.
6. (a) Classify Alkyl Arenes. Draw the structure of ethyl benzene  
(b) Write the mechanism of Friedel-Craft's Alkylation reaction

7. Discuss the following properties of d-block elements  
i. ionic radii ii. Magnetic properties
8. Convert  $\text{ArMgX}$  to a  
i. primary alcohol  
ii. carboxylic acid

**Q.3. ATTEMPT ANY FOUR**

**5 MARKS EACH.**

1. Explain the term activated aromatic rings by taking the primary amino group as an example.
2. Explain the term de-activated aromatic rings by taking the cyano group as an example.
3. What is a nitrating mixture? Write the mechanism of nitration.
4. Draw structure of the following compounds
  - i. p-xylene
  - ii. phthalic acid
  - iii. 4-chloro-2-hydroxy benzoic acid
  - iv. Naphthalene-1-carboxylic acid
  - v. beta iodo naphthalene
5. What is IPSO substitution. Convert BSA to
  - i. nitrobenzene
  - ii. benzoic acid
  - iii. phenol
  - iv. bromobenzene
6. a) State Huckel,s rule. Is cyclohexene aromatic in nature. WHY  
b) Write a note on the structure of anthracene
7. Draw structure of
  - i. 1,2,5 trimethyl benzene
  - ii. I-nitro-4-chloro benzene
  - iii. anthracene-4- carboxylic acid
  - iv. 1-amino naphthalene
  - v. m-benzene dicarboxylic acid
8. What is the Action of sodamide/ liquid ammonia on o-bromotoluene. Write the mechanism involved.



**Q.4. (A) Choose the correct option**

**1 mark each**

1. The BMO of the helium molecule contains.....electrons
  - a. 2
  - b. 6
  - c. 5
  - d. 3
2. Atomic number of boron is
  - a. 3
  - b. 4
  - c. 7
  - d. 6
3. Silicones are an example of
  - a. organic polymers
  - b. resins
  - c. inorganic polymers
  - d. None of above
4. The functional group of quinol is
  - a. -OH
  - b. -COOH
  - c. R-O-R
  - d. -COOR
5. Phenol loses a proton to form the
  - a. methoxide ion
  - b. propoxide ion
  - c. ethoxide ion
  - d. phenoxide ion
6. Copper belongs to the
  - a. 4d series
  - b. 5d series
  - c. 3d series
  - d. none of above.
7. The group which activates the benzene ring towards electrophilic substitution is
  - a. -CN
  - b. -CHO
  - c. -NH<sub>2</sub>
  - d. None of above

8. An electrophile is
- A neutral species
  - A electron deficient species
  - A electron rich species
  - None of above
9. The general formula of an aromatic Grignard reagent is
- RMgX
  - Ar-Mg-X
  - Ar-Mg-R
  - None of above.
10. Dry ice is also called as
- oxygen
  - liquid nitrogen
  - solid carbon dioxide
  - none of above

**(B) STATE TRUE OR FALSE**

**1 MK EACH**

- The atomic number of silicon is 14
- Phenol is acidic in nature
- Aniline is an example of a primary amine
- Phenanthrene is an aromatic compound
- A pi bond is formed by lateral overlap of atomic orbitals.

=====

- Note: 1. All questions are COMPULSORY.  
2. Use of non-programmable calculator is allowed.  
3. Figures do right indicates full marks

**Q.1 Attempt any four 20M**

- A. How are the aromatic compounds obtained from coal tar?
- B. What is Biomass? How it is transferred into chemical give one example?
- C. Describe Fischer- Tropsch synthesis method for production of alkanes from Syngas.
- D. How is Dodecyl Benzene (DDB) prepared industrially.
- E. Explain what is sulphonation? Give its mechanism.
- F. Explain the principle and process of vacuum distillation.
- G. What is catalytic reforming? Explain the different types of reaction taking place.
- H. How is absolute alcohol prepared from rectified spirit using azeotropic distillation?

**Q2 Attempt any four 20M**

- A. Discuss the criterion for the spontaneity of a chemical Reaction.
- B. Discuss the important physical principle involved in manufacture of Ammonia by Haber's process.
- C. Discuss the effect of change of pressure in manufacture of SO<sub>3</sub> in contact process.
- D. Give schematic well labeled diagram of contact process.
- E. What Oxygen cycle give its importance.
- F. Write short notes on:  
i) Mithi river ii) Chernobyl accident
- G. Explain the concept of four Rs.
- H. Derive an expression for Equilibrium Constant for a reversible reaction in terms of Concentration.

**Q.3 Attempt any four 20M**

- A. What are the quality standards for portable water?
- B. 100 ml sample of water was analysed by Winkler method. The end point with titration with 0.020 M sodium thiosulphate solution was recorded at 4.80 ml. Calculate the dissolved oxygen concentration in the water.
- C. Define PH and POH find out them for pure water.
- D. Write notes on the main ions involved in water.
- E. Discuss three layered structure and temperature variation with depth of sea water
- F. Explain the requirement of dissolved oxygen (DO) of water How it is determined experimentally.
- G. Describe with the help of suitable diagram the source of fresh water known as ground water.
- H. Explain the hydrogen bonding in water and its effect on boiling point.

**Q.4 Attempt All****15M****1- Fill in the Blanks**

1. The Value of  $K_p$  ..... with temperature.
2. The catalyst accelerates the reaction by ..... The activation energy of the reaction
3. Waste prevention techniques are commonly summarized as 4 Rs. Reduction, Reuse..... and .....
4.  $\text{CO}_2$  is returned to the atmosphere by ..... And ..... processes
5. The bond angle Of H-O-H bond in water is .....

**II. Multiple choice question****10M****1. For 0.02 molar  $\text{HNO}_3$  the concentration of  $\text{H}^+$  ions will be**

- A. 0.02 m  
B. 0.01 m  
C. 0.03  
D. 0.04

**2. If the  $\text{H}^+$  ion concentration of an acid is 105 moles/ $\text{dm}^3$ . Its PH will be**

- A. 11  
B. 3  
C. 0 to 6  
D. 5

**3. Solubility product of a substance is;**

- A. Concentration of ions  
B. Product of con of Ions  
C. Product of Cone of water  
D. Any of the above

**4. Liquids are purified by,**

- A. Crystallization  
B. Evaporation  
C. Distillation  
D. Any of the above

**5. Catalyst used in preparation of  $\text{SO}_3$** 

- A. Pt  
B. Fe  
C.  $\text{V}_2\text{O}_5$   
D. Ni

**6. Equilibrium is —in nature**

- A. Static  
B. forward  
C. dynamic  
D. Any of the above

**7. Which indicator is most suited for total acidity of water**

- A. Bromo phenol  
B. Murexide  
C. Phenolphthalein  
D. Diphenyl amine

**8. If the amount of TDS in water is more**

- A. Solubility of oxygen decreases  
B. Inorganic salt content decreases  
C. Density increases  
D. All of the above

**9. The water quality parameter critical for survival of fish in water body is**

- A. Dissolved Oxygen  
B. Hardness  
C. Alkalinity  
D. None of the above

**10. The lowest layer of atmosphere extended upto 10 km from sea level is**

- A. Stratosphere  
B. Troposphere  
C. Mesosphere.  
D. Hydrosphere

=====

Note: 1. All question are compulsory.  
2. Draw a neat & labelled diagrams wherever necessary.

---

- 1. Attempt any four from the following. (5 marks each) 20**
- a) Define genetics and give its scope and importance.
  - b) Differentiate between back cross and test cross.
  - c) Describe in brief co - dominance.
  - d) Explain in brief pedigree analysis.
  - e) Define multiple alleles and give its characteristics.
  - f) Explain briefly Rh blood group system.
  - g) Write a note on pleiotropy.
  - h) Which factors affect crossing over.
- 2.a) Attempt any one from the following. 10**
- i. Classify the chromosome on the basis of position of centromere.
  - ii. Explain XX-XY mechanisms of sex determination.
- b) Attempt any two from the following. (5 marks, each) 10**
- i. Describe Lampbrush chromosomes.
  - ii. Write a note on gynandromorph.
  - iii. Explain briefly the sex determination in crocodile.
  - iv. Explain briefly Y - linked inheritance.
- 3. Attempt any two from the following. (10 marks each) 20**
- a) Describe Griffith transformation experiment.
  - b) Describe the types of DNA.
  - c) Explain the mechanism of DNA replication.
  - d) Explain one gene - one enzyme hypothesis. «
- 4. Write short notes on the following.(5 marks each) 15**
- a) Law of segregation.
  - b) Sex limited genes.
  - c) Chemical composition of nucleic acid.

=====

TIME: 2hrs 30min

Max marks: 75

**Note: 1) All questions are compulsory.****2) Draw a neat & labelled diagrams wherever necessary.**Q.1. (a) Describe physiological parasitic adaptation in helminthes 10Marks**OR**

(a) Describe sexual reproduction in porifera

(b) **Write short notes on (any two)** 10Marks

- i.) Types of coral reefs
- ii.) Polymorphism in anthozoa
- iii.) Megalopa larva
- iv.) Shells of gastropods

Q.2.(a) Describe different types of eggs 10Marks**OR**

(a) Explain the process of gastrulation add a note on epiboly in mollusc

(b) **Write short note on (any two)** 10Marks

- i.) Blastula of amphioxus
- ii.) Spiral cleavage
- iii.) Coelom formation in birds
- iv.) Types of blastula

Q.3(a) Describe the effect of light on animals 10Marks**OR**

(a) Describe survivorship curves

(b) **Write short notes on (any two)** 10Marks

- i.) Aquatic ecosystem
- ii.) Temporary and permanent plankton
- iii.) Migration
- iv.) Nudation as a stage of succession

Q.4. **Write shorts notes on**(a) Describe life cycle of Ascaris 5Marks**OR**

(a) Explain mechanism of insect metamorphosis

(b) Explain process of egg activation 5Marks**OR**

(b) Describe emboly by ingression in echinoderms

(c) Types of ponds 5Marks**OR**

(c) Relevance of ecosystem development theory to human ecology

- Note: 1. All question are compulsory.  
2. Figure to the right indicate full marks.  
3. Draw well labeled diagram wherever necessary.

**Q1) Attempt any four of the following** **20**

- A) What is nutrition? Explain the types of Heterotrophic Nutrition.
- B) Explain the process of nutrition in Amoeba.
- C) Explain the Nutritional apparatus in Earthworm.
- D) Write a notes on Ruminant stomach.
- E) Describe the process of digestion of carbohydrates.
- F) Write a notes on protonephridia in planaria.
- G) Explain the internal structure of human kidney.
- H) Write a note on nature and synthesis of uric acid.

**Q2A) Answer any one of the following.** **10**

- 1) Describe Blood as a circulatory fluid.
- 2) Explain the circulatory system of cockroach.

**B) Attempt any two of the following.** **10**

- 1) Write a note on Haemolymph.
- 2) Explain Double circulation in man.
- 3) Enlist the features of respiratory surfaces.
- 4) Write a note on 4- chambered heart.

**Q3) Attempt any two of the following.** **20**

- A) Explain irritability in Paramecium.
- B) Write a note on Glucose homeostasis.
- C) Write a note on spermatogenesis in man.
- D) Explain various types of fertilization studied by you.

**Q4) Write short notes on -** **15**

- A) Types of autotrophic nutrition.
- B) Plasma as a circulatory fluid.
- C) Structure of Human Ovum.

=====

(75/25)

S.Y.B.Sc Regular Exam (Sem-III) Sub-Zoology - III

SSR-318	161018	Hrs: 2½	MM : 75
---------	--------	---------	---------

Note: 1. All questions are compulsory.  
 2. Draw neat and labelled diagrams wherever necessary.

1. Attempt any four from the following. (5 marks each) 20

- a) What is an innate behavior ? Explain with an example.
- b) Describe is brief imprinting.
- c) Explain is short Pavlov experiment on classical conditioning.
- d) Write in short on insight learning.
- e) What is the significance of mimicry and warning colouration.
- f) Give the causes and functional significance of displacement activities.
- g) Briefly describe the different types of territories.
- h) What is Hanuman langur and explain its social behaviour.

2.a) Attempt any one from the following. 10

- i. Give an account of the life history of Fasciola hepatica.
- ii. Describe the pathogenicity, control measures and treatment with respect to head louse.

b) Attempt any two from the following. (5 marks each) 10

- i. Describe the structural adaptations in endoparasites.
- ii. What is host specificity.
- iii. Describe filariasis.
- iv. Give the signs and symptoms of bird flu.

3. Attempt any two from the following. (10 marks each) 20

- a) State the economic importance of honey.
- b) Write a note on marketing of vermicompost.
- c) Describe filtration and cooling with respect to dairy processing.
- d) Which are the non - protein nitrogen substances of milk.

4. Write short notes on the following. (5 marks each) 15

- a) Schooling behaviour in fish.
- b) Vectors.
- c) Paneer.

=====



Note: 1. All questions are COMPULSORY.

2. Use of Scientific calculator is allowed.

3. Figures to the right indicate full marks.

4. Symbols have their usual meanings else specified.

(75: 75)

**Q.1. A) Attempt any TWO of the followings:-**

(16)

i) Two mutually perpendicular S.H.Ms are described by

$$x = a_1 \sin(\omega t + a_1)$$

$$y = a_2 \sin(\omega t + a_2)$$

Find their resultant motion.

ii) What is reversible compound pendulum? Derive an expression for the acceleration due to gravity in terms of two nearly equal time periods about the two parallel knife edges of the pendulum.

iii) Expand  $f(x) = x^2$  for  $-\pi \leq x \leq \pi$  in a Fourier series. Using the series

$$\text{expansion, prove that } \sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$$

iv) Define centre of suspension and centre of oscillation. Show that in compound pendulum the centre of suspension and centre of oscillation are interchangeable.

**B) Attempt any ONE of the followings:-**

(4)

i) Two S.H.Ms are represented by

$$x = 4 \sin(4\pi t + \frac{\pi}{2}) \text{ and } x_2 = 3 \cos(4\pi t)$$

Calculate the resultant amplitude.

ii)  $f(x) = \left(\frac{\pi-x}{2}\right)^2$  in the range  $(0, 2\pi)$  is given as

$$f(x) = \frac{\pi^2}{12} + \sum_{n=1}^{\infty} \frac{\cos nx}{n^2}$$

$$\text{Hence show that } \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}$$

**Q.2A) Attempt any TWO of the followings:-**

(16)

i) Obtain the solution of the wave equation of the vibrating string in one dimension by separating variables method.

ii) Find the solution of the wave equation

$$\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$$

Such that  $u = E_0 \cos \omega t$  when  $x = l$

$$u = 0 \quad \text{when } x = 0$$

iii) A metal bar, insulated along its sides, is 1m long. It is initially at room temperature of 15°C and at time  $t = 0$ , the ends are placed into ice at 0°C. Find an expression for the temperature at a point P at a distance  $x$  m from one end at any time  $t$  seconds after  $t = 0$ .

iv) A square plate is bounded by the lines  $x = 0, y = 0, x = 1$  &  $y = 1$ . Apply the Laplace equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  to determine the potential distribution  $u(x, y)$

over the plate,

subject to the following boundary conditions

$$u = 0 \text{ when } x = 0 \quad 0 \leq y \leq 1$$

$$u = 0 \text{ when } x = 1 \quad 0 \leq y \leq 1$$

$$u = 0 \text{ when } y = 0 \quad 0 \leq x \leq 1$$

$$u = 4 \text{ when } y = 1 \quad 0 \leq x \leq 1$$

**B) Attempt any ONE of the followings:-**

(4)

i) Form the partial differential equation from

$$u(x, y) = (x - a)(y - b)$$

ii) Find the general solution of the given ordinary differential equation

$$X'' + 16X = 0$$

where prime indicates the differentiation of  $X$  with respect to  $x$ .

**Q.3(A) Attempt any TWO of the followings:-**

(16)

1. Explain Koenig's method to determine  $Y$  of the material of the beam. State the advantages of this method.
2. Obtain an expression for conservation of linear momentum of the system of particles.
3. Explain the factors affecting the acoustics of building.
4. For a system of particles show that  $\overline{F_{ext}} = \frac{d\vec{P}}{dt}$

**Q.3(B) Attempt any One of the followings:-**

**(4)**

1. Two rods of same material same length and weight but one has circular cross-section and other square, produce equal depression when loaded separately compare the loads.
2. A class room has dimensions  $20 \times 15 \times 5 \text{ m}^3$  The reverberation time is 3.5 sec. Calculate the total absorption of its surface and average absorption coefficient.

**Q.4A) Attempt any ONE of the followings:-**

**(5)**

- i) The motion of a particle in S.H.M. is given by  $x = a \sin \omega t$ . If it has a speed  $u$  when the displacement is  $x_1$  and speed  $v$  when the displacement is  $x_2$ . Show that

the amplitude of the motion is  $a = \sqrt{\frac{v^2 x_1^2 - u^2 x_2^2}{v^2 - u^2}}$

- ii) What are the advantages of a compound pendulum over a simple pendulum?

**B) Attempt any ONE of the followings:-**

**(5)**

- i) Using the method of separation of variables, find the solution of the following

equation  $\frac{\partial u}{\partial x} + u = \frac{\partial u}{\partial t}$

- ii) List some important partial differential equation in physics.

**C) Attempt any ONE of the followings:-**

**(5)**

1. Obtain an expression for moment of restoring couple.
2. Obtain an expression for coefficient absorption and its measurement.

=====

- Note: 1. All questions are COMPULSORY and carry equal marks.  
 2. Figures to the right indicate full marks.  
 3. Use of simple non-programmable calculator is allowed

**Q1 A. Attempt any Two of the following: (16 Marks)**

1. Verify stokes theorem for  $\vec{F} = 2xy\hat{i} + 2yz\hat{j} + 3zx\hat{k}$  for surface in  $x - y$  plane bounded by lines  $x = 0$ ,  $y = 0$ ,  $x = 2$  and  $y = 2$ .
2. Calculate  $I = \int_C (x^2 dy - y dx)$  over the following paths:
  - a) Straight line  $y = 2x$  from  $(0,0)$  to  $(2,4)$
  - b) Parabola  $y = x^2$  from  $(0,0)$  to  $(2,4)$
  - c)  $(0,0)$  to  $(2,0)$  to  $(2,4)$
3. Explain spherical polar coordinate system. Derive Transformation and inverse transformation relations between spherical polar coordinate system and Cartesian coordinate system.
4. Discuss fundamental theorem for gradients.

**(B) Attempt any One of the following: (04 Marks)**

1. Using cylindrical coordinates, evaluate the volume integral  $\iiint_V dV$  over the volume  $V$  of a cylinder of height  $h$  and radius  $p$ .
2. Show that:  $\nabla \cdot (\phi \vec{A}) = (\nabla \phi) \cdot \vec{A} + \phi (\nabla \cdot \vec{A})$

**Q2.A Attempt any Two of the following: (16 Marks)**

1. Find electrostatic potential due to a thin uniformly charged spherical shell
  - a) Inside the shell.
  - b) Outside the shell.
2. Explain principle of superposition of force. Derive expression for electric field  $E$  due a thin uniformly charged ring of radius  $a$ , total charge  $Q$ , at a point on it's axis at a distance  $L$  from its centre.
3. Define electric potential and derive an expression for electric potential difference. Also, derive an expression for electric potential at a point due to a point charge.
4. Derive an expression for Magnetic field at a point at a distance of  $x$  from a straight current carrying wire of finite length. Modify the result for infinitely long wire.

(B) Attempt any One of the following: (04 Marks)

1. Derive an expression for volume charge density. Hence write down expression for electric field due to a continuous volume charge distribution.
2. A long straight wire carries a current of 10A. Calculate magnetic field at a point 5cm from the wire. Given  $\mu_0 = 4\pi \times 10^{-7} \text{ N/A}^2$ .

Q3A. Attempt any Two of the following: (16 Marks)

1. What is Cyclotron? Discuss its principle, working.
2. Explain a motion of a charged particle in a uniform constant electric field. Derive an expressions for particle displacement.
3. Under what conditions does the charged particle performs a helical path when passes through a uniform magnetic field? What is the time period of a circular path?
4. Draw a neat and labeled diagram of a CRO and state the function of each part.

(B) Attempt any one of the following: (4 Marks)

1. In a velocity selector, a p.d. of 20V between two parallel plates that are, 0.8 cm apart. What is the velocity of the emerging ions if  $\vec{B} = 6 \times 10^{-3} \text{ T}$ .
2. An ion of charge (+2e) and  $m = 6.68 \times 10^{-27} \text{ kg}$  is accelerated through a p.d. of  $10^4 \text{ V}$  and enters a magnetic field of induction 1.2 T. perpendicular to the field. Find the Lorentz force acting on it.

Q4. Attempt any Three of the following: (15 Marks)

1. Calculate Cartesian coordinates corresponding to spherical polar coordinates  $(r, \theta, \phi = (5\text{cm}, 60^\circ, 30^\circ)$ .
2. Evaluate divergence and curl of  $\vec{f} = x\hat{i} + y\hat{j} + z\hat{k}$
3. Four equal charges, each having charge 1C, are placed at the four corners of a square of side length 2cm. Find the work done in bringing a charge of 4C from infinity to the centre of the square.
4. An electron in Hydrogen atom moving in circular path around the proton produces a magnetic field of 14 Tesla at the center of its orbit. Calculate its frequency of rotation. Given: radius of orbit =  $0.5\text{\AA}$ , electron charge =  $1.6 \times 10^{-19} \text{ C}$ .
5. Define 'Deflection sensitivity' of a CRO. On what factors it depends?
6. Write a short note on 'Velocity Selector.'

=====

- Note: 1. All questions are COMPULSORY.  
 2. Draw neat diagrams whenever necessary.  
 3. Figures to the right indicate full marks.  
 4. Use of log table or non-programmable calculator is permitted.

**Q1 (A) Attempt any TWO [Each question carry 8 mark] [16 M]**

- Describe Otto cycle
- Obtain an expression for efficiency of Diesel cycle.
- What is the principle used in the working of a refrigerator? Define coefficient of performance.
- State and prove Carnot theorem in Thermodynamics.

**Q1 (B). Attempt any ONE [04 M]**

- A Carnot engine has its source at 100°C and its sink is maintained at a constant temperature by means of ice at 0°C. If it is working at the rate of 100 watts, how much ice will melt in one minute?
- Efficiency of a Carnot cycle changes from  $\frac{1}{6}$  to  $\frac{1}{3}$  when source temperature is raised by 100K. Calculate the temperature of sink.

**Q2 (A). Attempt any TWO [Each question carry 8 mark] [16 M]**

- Explain in brief the states of operation of a Carnot cycle by plotting (i) P - V diagram and (ii) T - s diagram. Show that T - S diagram the efficiency of the cycle is  $\eta = 1 - \frac{T_2}{T_1}$  where  $T_2$  and  $T_1$  are the temperatures of hot and cold reservoir.
- State and explain principle of increase in entropy.
- Derive the Clausius - Clapeyron heat equation.
- Deduce Maxwell's thermodynamical relations.

**Q2 (B). Attempt any ONE [04 M]**

- Calculate the rise in internal energy when 5 kg of air raised by 2°C at constant volume. [Given :  $\gamma = \frac{5}{3}$ ,  $C_p = 993 \text{ J kg}^{-1}\text{K}^{-1}$ ]
- When 1 gram of water is converted into steam of 1676 cm<sup>3</sup>, determine under what pressure water will boil at 130°C? Given: Latent heat of steam (L) = 540

cal/g and Mechanical equivalent of heat (J) =  $4.2 \times 10^7$  erg/cal. And 1 atmospheric pressure =  $10^6$  dynes/cm<sup>2</sup>.

**Q3 (A). Attempt any TWO [Each question carry 8 mark] [16 M]**

- What are different methods of liquefaction of gases. Explain Cooling by Adiabatic expansion.
- Explain Cooling by Evaporation under reduced process.
- Explain liquefaction of air: Linde process.
- Explain Joule-Thomson effect.

**Q3 (B). Attempt any ONE [04 M]**

- If a He gas at 30°C confined in a cylinder at 100 atm is suddenly released to atmospheric pressure. Calculate the resulting temperature. ( Given :  $\gamma = 1.4$ )
- O<sub>2</sub> gas is made to undergo adiabatic throttling and the pressure is reduced by 100 atm. If initial temperature is 30° C calculate the drop in temperature. Given  $a = 13.2 \times 10^{-2}$  N/mol,  $b = 31.2 \times 10^{-6}$  m<sup>3</sup> / mol,  $R = 8.3$  J / mol K,  $C_p = 3.5 R$ .

**Q4 (A). Attempt any THREE [Each question carry 5 mark] [15 M]**

- Write note on Carnot ideal heat engine.
- Give the Kelvin - Planck and Clausius statements of the second law of thermodynamics. Show that the two statements although seemingly different.
- Using Maxwell's thermodynamical relations, deduce the following thermodynamic relations.

$$\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P \quad \text{and} \quad \left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P.$$

- Using equation of change in entropy for an ideal gas  $dS = C_v \frac{dt}{T} + R \frac{dv}{v}$ , , show (i) relation of change in entropy in terms of volume and pressure.
- Write a note on cooling by freezing mixture,
- Draw a neat diagram of Regenerative cooling.

=====

- Note: (1) All question on compulsory.  
(2) All question carry equal marks  
(3) Figures to the right indicate full marks.

- 
- 1.a. Explain external morphology of Funaria. [8]  
b. Discuss Hypogynous, Epigynous and Perigynous flowers. [7]  
OR  
b. Give a detailed account on Range of Thallus in Algae. [7]
- 2.a. Give systematic position of Sargassum. Add a note on its external morphology. [8]  
b. Explain Life cycle of Dictyota. Draw thallus of Dictyota. [7]  
OR  
b. Describe sex organs in Sargassum. [7]
- 3.a. Give general characters of Anthocerotae [8]  
b. Explain sexual reproduction in Funaria. [7]  
OR  
b. Explain the life cycle of Anthoceros [7]
- 4.a. Give an account of types of Placentation studied by you [8]  
b. Discuss the distinguishing characters of Magnoliaceae and mention two economic importances of the same.. [7]  
OR  
b. Discuss the distinguishing characters of Myrtaceae and mention two economic importances of the same. [7]
5. Add a note on any three of the following. [15]  
a. Pigments in Algae  
b. L.S. of sporophyte of Anthoceros  
c. Androecium of family Asteraceae  
d. Types of Corolla



Note: 1. All questions are COMPULSORY.

2. All questions carry equal marks.

3. Figures to the right indicate full marks.

(75/25)

- 
- 1.a. Explain Social Forestry in detail. [8]
- b. Explain Pharmacopoeia and state its significance. [7]
- OR
- b. Explain DNA replication in Prokaryotes. [7]
- 2.a. Give an account on Tannins. Discuss its sources and uses [8]
- b. Give an account of alkaloid and types of alkaloids. [7]
- OR
- b. Explain Volatile oil and state its uses. [7]
- 3.a. Give an account on Paper yielding plants. [8]
- b. Discuss Tropical forest in India. [7]
- OR
- b. What are fibres? Discuss different types of fibres. [7]
- 4.a. Describe in detail the Central dogma of Protein synthesis. [8]
- b. Explain Transcription in Eukaryotes
- OR
- b. Explain Transcription in Prokaryotes [7]
5. Add a note on any three of the following. [15]
- a) Resins
- b) RNA processing
- c) Afforestation
- d) Types of papers
- =====

8/1/2021 sem 3 Reg. Botany 2

SSR-310

161013

Hrs: 2½

MM : 75

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

- 1.a. State Principal and working of Electron Microscope, [8]  
b. Explain the structure of DNA. Add a note on its types. [7]

OR

- b. What are Aneuploids and Euploids? Give their application in crop improvement. [7]

- 2.a. Give an account on TLC. [8]

- b. Explain Paper Chromatography. [7]

OR

- b. Describe vertical electrophoresis. [7]

- 3.a. Give an account on Glyoxysomes and Peroxysomes. [8]

- b. Draw and describe ultrastructure of Ribosome. [7]

OR

- b. Explain Metaphase-I and Anaphase-I in meiotic division. [7]

- 4.a. What is cytoplasmic inheritance? Explain streptomycin resistance in Chlamydomonas? [8]

- b. Explain Petite colonies in Yeast and Plastid transmission in plants. [7]

OR

- b. Explain effects of chromosome numbers in crop improvements. [7]

5. Add a note on any three of the following. [15]

- a. Interphase in Cell Cycle  
b. Light Microscope  
c. Inversion and translocation of chromosomes  
d. Ribosomes

=====