

Instructions:

All Questions are compulsory.

Make suitable assumption wherever necessary.

Write in neat handwriting.

Mixing of sub questions are not allowed.

Q1. Attempt any two (10x2=20marks)

- What are the different types of Linux File Systems.
- Explain multithreading model.
- Explain the structure of Operating System.
- What is Linux Architecture. Explain in brief.

Q2. Attempt any two (10x2=20marks)

- Explain the test command with the help of an example.
- Explain the Critical Section problem.
- Explain deadlock avoidance.
- Explain the Resource Allocation graph.

Q3. Attempt any two (10x2=20marks)

- What is demand paging.
- Explain the seven attributes of the ls command.
- Explain the multiple processor scheduling.
- Explain page replacement algorithm.

Q4. Attempt the following questions:

- Explain the term mutual exclusion. (8m)
- Explain contiguous memory allocation. (7m)

OR

- What are the different types of editors in Linux. (8m)
- What are the different states of process. Explain in brief (7m)

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Max Marks: 75

Time: 2½ hrs

Instructions:

- 1) All questions are compulsory.
- 2) Write in clear, neat, unambiguous and legible writing.
- 3) No mixing of subquestions is allowed.

Q1. (20)

a) Explain the structure of a typical Java program with example. (7)

OR

b) Explain in detail how Java solved the major issues of the requirement of a programming language for internet applications. (7)

c) Explain how to create arrays (single dimension) and access them in Java with the help of examples. (7)

OR

d) Explain 2 logical operators and 2 arithmetic operators in Java programming language with the help of examples. (7)

e) WAP in Java to display the 15th to 30th Fibonacci numbers. (6)

OR

f) WAP in Java to display the factorial of first 10 natural numbers. (6)

Q2. (20)

a) Explain overloading constructor? How is it implemented in Java? (7)

OR

b) What is the syntax for using the abstract for a class and method? Explain with example. (7)

c) Explain the keyword 'package' in Java. List any five packages of Java library. (7)

OR

d) Explain the mechanism of inheritance in Java with the help of examples. (7)

e) Write a JAVA program to declare an abstract class Vehicle with an abstract method named numWheels() to return the number of wheels in a vehicle. Provide subclasses Car and Truck that each implements this method. Create instances of these subclasses and demonstrate the use of this method. (6)

OR

f) Write a program in JAVA which declares a class Circle with radius as its only data member. Include constructor to initialize the radius and method to calculate the area of circle. It also includes class named Cylinder. It inherits all the attributes of the base class. Initialize constructor to initialize height and method to calculate the volume of cylinder. Instantiate and output the radius, height and volume of cylinder. Use super keyword to pass an argument to the constructor of the base class. (6)

Q3. (20)
a) Describe the following methods defined in Applet class: init(), start(), stop(), paint(). (7)

OR

b) Mention the different parameters used in an Applet tag. (7)
c) Explain any two Listener interfaces for event handling and the methods in those listeners. (7)

OR

d) Explain the 'drawArc' and 'fillOval' methods of Graphics class. (7)
e) WAP in Java to create an applet which draws 100 circles of radius 10 in a square matrix arrangement. (6)

OR

f) WAP in Java to create an applet which draws 100 squares of side 10 in a square matrix arrangement. (6)

Q4. (15)
a) Explain 14 keywords in Java language. (7)

OR

b) What do you understand by Exception handling? Explain try-catch-finally block with example. (7)
c) Explain how inheritance is implemented in Java. What is the usage of the keyword super. (8)

OR

d) WAP in Java to encapsulate a Solid sphere. Implement methods to return the volume and surface area of a sphere. (8)

Time: 2 ½ hours

Marks: 75

Q. 1 Answer the following (Any two)

[20]

- What do you mean by image map? Give example.
- Explain audio tag in HTML with example.
- Explain form tag with example.
- What is linking? Explain external linking with example.

Q. 2 Answer the following (Any two)

[20]

- Explain different types to include CSS on web page with an example.
- What are the ways to embed JavaScript in an HTML page?
- Write a program to take 2 numbers and print the sum using JavaScript.
- Explain logical operators with example.

Q. 3 Answer the following (Any two)

[20]

- List different types of jumping statements in PHP. Explain any one with example.
- Write a program to print greater between 3 numbers.
- Explain DML statement in MYSQL.
- Write MySQL query to modify the data in a table.

Q. 4 Answer the following

[15]

- What do you mean by validation give example?

[7]

OR

Write a program to print days of week using switch case.

- List different types of arrays. Explain any one with example.

[8]

OR

What do you mean by Event? Give example of event handling.

17/03/17

S.Y BSc Regular Exam / Sem -IV / Paper -I

Sub :- Zoology

75:25

SYBSc Zoology

Sem IV Paper I Course VIII

Time: 2 1/2 hrs

Max Marks: 75

- Note: 1) All questions are compulsory.
2) Figure to the right indicates full marks.**

Q. 1 Answer any Four of the following

20 Marks

- I. Explain in brief Oparin and Haldane theory
- II. Define Paleontology and add a note on types of fossils
- III. Write a note on evidence of evolution from physiology
- IV. Describe in brief Darwin's theory of Natural Selection
- V. Write a note on Modern Scientific theory
- VI. Discuss brief account of origin of life
- VII. Write an explanatory note on Neo Darwinism
- VIII. Give main features of Mutation theory

Q.2 a) Answer any One of the following

10 Marks

- I. Discuss brief account of origin of life.
- II. How do post-zygotic barriers lead to reproductive isolation?

b) Answer any Two of the following

20 Marks

- I. Differentiate between Stabilizing selection and disruptive selection.
- II. Write short note on Founder Effect
- III. Write short note on Genetic polymorphism
- IV. Explain role of migration in evolution

Q.3 Answer any Two of the following

10 Marks

- I. Explain role of computers in research.
- II. Elaborate on ethics in clinical research.
- III. State biodiversity board and National Biodiversity Board
- IV. Write a note on Oral presentation and 7c's rule in scientific writing

Q4 Answer the following

15 Marks

- I. Write a note on evidences from Vestigial Organ
- II. Write a short note on gene pool
- III. Write characteristics of scientific research

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S.y BSc Regular Exam / Sem IV / Paper - II / 75:25

SSS-416

20170318

Hrs: 2½

MM : 75

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

Sub : Zoology

- 1) **Attempt any four from the following (5 marks each)** **20 Marks**
- a) Differentiate between prokaryotic and eukaryotic cell
 - b) Describe nucleocytoplasmic interaction.
 - c) Give the functions of plasma membrane.
 - d) Write in short on septate junctions and plasmodesmata
 - e) Define semipermeable membrane and add a note on factor affecting diffusion of solutes
 - f) What is active transport? Give its functions.
 - g) Describe the structure of microtubules
 - h) Describe the composition of microfilaments
- 2 a) **Attempt any one from the following (10 marks each)** **20 Marks**
- i) Give an account of ultrastructure of golgi complex.
 - ii) Enumerate the functions of lysosomes.
- b) **Attempt any two from the following (5 marks each)**
- i) Describe the types of endoplasmic reticulum.
 - ii) Explain the morphology and chemical composition of golgi complex
 - iii) Give the occurrence and morphology of mitochondria
 - iv) Describe the biogenesis of mitochondria
- 3) **Attempt any two from the following (10 marks each)** **20 Marks**
- i) Give the concept of macromolecules and macromolecules
 - ii) Define and explain glycosidic bond with suitable examples
 - iii) Describe the non polar aromatic amino acids.
 - iv) Describe saturated and unsaturated fatty acids
- 4) **Write short notes on the following (5 marks each)** **15 Marks**
- a) Shapes, number and position of nucleus.
 - b) Types of lysosomes
 - c) Biological importance of carbohydrates

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- Note: 1. All question are compulsory.
2. figures to the right indicate full marks

Q.1. Write note on any four of the following (20M)

- i. Polylecithal eggs
- ii. Various types of sperms in animals
- iii. Discoblastula
- iv. Amnion
- v. Chorio vetteline placenta
- vi. Types of coelom
- vii. Emboly
- viii. Exogenous yolk sac

Q.2.a. Answer any one of the following. (10M)

- i. Describe male reproductive system and its hormonal regulation.
- ii. Give an account of Embryo transfer. Add a note on intrafallopian transfer.

b. Answer any two of the following (10M)

- i. Write note on menopause
- ii. Explain surgical treatment of infertility
- iii. What are IUCD? How do they work as barriers for fertilization?
- iv. Write note on surrogacy.

Q.3. Answer any two of the following (20M)

- i. What are the types and sources of soil pollution
- ii. How water pollution is affecting environment and how can we control it?
- iii. What is climate change? Discuss it with reference to pollution.
- iv. Give an account of various means of noise pollution

Q.4. Answer the following.

- a. Write note on allantois (05M)

b. **Answer in one sentence**

(05M)

i. What is cryptochidism?

ii. Write causative agents of syphilis

iii. What is amenorrhea?

iv. What is azoospermia?

v. What is vasectomy?

c. Write short note on e-waste.

(05M)

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14/03/17

S.Y BSc Regular Exam / SEM IV / Paper - I / 75:25

SSS-407 20170314 Hrs: 2½ MM : 75

- Note: 1. All questions are compulsory & carry equal marks.
2. Figures to the right indicate full marks.
3. Use of simple nonprogrammable calculator is allowed.

Sub:- PHYSICS

A. Attempt any two [08 Marks Each] (16)

1. What is Brewster's law? Derive Brewster's law.
2. With the help of neat labelled diagram, explain Malu's law.
3. Explain construction and working of wire-grid polariser.
4. Give mathematical analysis of the superposition of two linearly polarised waves at right angles to each other.

B. Attempt any one [04 Marks Each] (04)

1. If the angle between a polarize and analyser is 60° and 1 is the intensity of light incident on polarizer, calculate intensity of transmitted through the analyser. For what angle between the polarizer and analyser intensity of transmitted light will be half of incident of light?
2. Angle of polarize for a transparent material is found to be 57.3° . Calculate refractive index and critical angle of the transparent material.

Q2. A. Attempt any two [08 Marks Each] (16)

1. Derive expression for magnitude and phase of resultant of n simple harmonic oscillators of same period and amplitude a and same phase difference (δ) between successive vibrations. Generalize the expression for $(\delta) \rightarrow 0$ as $n \rightarrow \infty$
2. Derive an expression for intensity due to Fraunhofer diffraction at double slit. Draw neat labelled diagram showing intensity pattern.
3. Explain meaning of half period zones. Construct half period zones for plane wavefront. Determine area and radius of n^{th} half-period zone.
4. Discuss diffraction at a straight edge.

B. Attempt any one [04 Marks Each]

1. Fraunhofer type diffraction occurs through a double slit, that has separation $b = 0.1\text{mm}$ and slit width $a = 0.030\text{mm}$. When monochromatic light of

5900Å illuminates the slit; fringes are observed on screen 0.5m away from the slit. What is the fringe spacing on the screen?

2. Calculate magnitude and phase of resultant of 20 simple harmonic oscillations of same period, same amplitude $a = 5$ cm, and same phase difference of $\delta = 0.04\pi$ between successive vibrations.

Q 3 A. Attempt any Two. (16)

1. Describe the principle, construction and working of Michelson Interferometer. Draw a neat labeled diagram.
2. Describe the formation of circular fringes in Fabry- Perot interferometer. How will you compare the two wavelengths.
3. Deduce an expression for the R.P. of a prism. Comment on the result.
4. A plane transmission grating has N lines. Show that R.P. of a grating is proportional to the order of the spectrum.

B. Attempt any ONE. (04)

1. Find the minimum plate separation in Fabry – Perot interferometer to get a free spectral range of 0.05Å in the wavelength region 6000Å .
2. A telescope has an objective of circular aperture 1m. If a light of wavelength 5000 nm illuminates the distant object, find the R.P. of a telescope.

Q4. Attempt any Three (05 Marks Each)

- a. Explain half-wave plate.
- b. Explain polarization by double refraction.
- c. Discuss construction of diffraction grating.
- d. Distinguish between interference and diffraction.
- e. Draw various types of fringes and different positions of mirrors in Michelson interferometer.
- f. Explain Rayleigh's criterion of resolution.

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15/03/17

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

Sub :- Physics

Q 1 A. Attempt any Two of the following. (16)

1. What do you understand by stabilization of operating point? What is stability factors?
2. Explain construction and Working of UJT with the help of V-I Characteristics.
3. Explain negative feedback. Explain the effect of negative feedback on input resistance and output resistance of an amplifier.
4. Explain what do you understand by frequency response of an amplifier? Define Bandwidth.

B. Attempt any one of the following. (04)

1. Design a dc voltage divider bias circuit for an amplifier with transistor having $\beta=100$ at collector current of 1 mA and supply of 16 V provide design for $V_{cQ} = V_{cc}/2$.
2. Determine the open circuit voltage of the source V_s to provide an amplifier i/p voltage V_i of 0.25 v when the internal resistance of the source is 50 ohm.

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

1. With the help of circuit diagram explain the working of phase shift oscillator.
2. Explain the working of colpitt's oscillator as the necessary circuit diagram.
3. What do you mean by Differential amplifier Explain the terms single ended input and double ended input operations.
4. Explain the making of operation amplifier as inverting ampilifier.

B. Attempt any one of the following. (04)

1. In case of phase shift oscillator, $R = 1m\Omega$ $c = 0.001uF$. Find the frequency of the oscillator.
2. What is ilp resistance of op-amp as inverting amplifier when its olp is — 12V with input of 120 mV. $R_f = 10 m\Omega$

Q 3 A. Attempt any Two. (16)

1. Explain the logic diagram, truth table and wave forms for a 3 bit binary up – ripple counter. State its limitations.
2. What are the basic blocks of 555 timer IC? What is the function of each of them? Draw the functional block diagram of 555.
3. Draw the logic circuit of Edge triggered J-K flip flop using NAND gates. Write down its state transition table and describe it.
4. With the help of schematic diagram, show how 555 timer can be used as voltage controlled oscillator or voltage to frequency converter.

B. Attempt any ONE. (04)

1. Perform the following conversion

(i) Binary $(1011.101)_2$ to $(?)_{10}$

Decimal conversion

And (ii) Octal $(175.264)_8$ to $(?)_{16}$

Hexadecimal conversion.

2. Design and 100 Khz and 60% duty cycle of A stable square wave generator using 555 Timer.

(Use- Astable's Duty cycle and frequency formula)

Assume $R_A = 1 K$ & $R_B = 2K$

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

1. Write a note on oscillation
2. Write any Five characteristics of DP – Awp
3. What power ratio is (a) one bel (b) $3dB$ and (c) $-3dB$
4. Explain the term "Temperature dependence of T_c ."
5. Using 2's complement method find $A+B$, $A-B$ and $-A-B$ in case if $A = 00010111$; $B=00011100$
6. Complete the conversion $(ABC.125)_{16} = (?)_2 = (?)_{10} = (?)_8$

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Note: 1. All questions are compulsory.

2. Figures to the right indicate full marks.

3. Use of non-programmable Scientific calculator is allowed.

Sub :- PHYSICS

Q 1 (A). Attempt any Two of the following. (16)

1. Discuss structural hierarchical model, starting from a star to filaments of the universe.
2. Discuss Einstein's theory of photoelectric effect.
3. Obtain an expression for phase velocity and group velocity for de Broglie waves, both relativistically and non-relativistically. Comment on the result.
4. Discuss Heisenberg's uncertainty principle of a moving particle in a wave mechanics and show their pictorial representation.

Q.1 (B). Attempt any one of the following. (04)

1. A light of wavelength 2000 \AA shines on a metal surface whose work function is 4 eV . Calculate the kinetic energy of the fastest photo electrons emitted and the stopping potential.
2. A galaxy is at a distance of 400 MPC from the earth. The spectral line $H \alpha$ emitted by the galaxy has an observed value 7218 \AA and the laboratory wavelength of $H \alpha$.

Q.2 (A) Attempt any Two of the following. (16)

1. Derive time independent form of Schrodinger wave equation in one dimension.
2. What is Hamiltonian operator? Explain Eigenvalue and Eigen function.
3. The Eigen function of a particle is given by $\Psi(x) = \begin{cases} A \sin \frac{\pi x}{L} & ; 0 < x < L \\ 0 & ; \text{elsewhere} \end{cases}$
 - a) Calculate the value of A.
 - b) Use this value of A, calculate $\langle x \rangle$.
4. Write down the operators for energy and momentum and show how Schrodinger time-dependent form of wave equation may be deduced from these operators.

(B) Attempt any ONE of the following. (04)

1. Verify the equation $y = A \cos w(t - \frac{x}{v})$ is a solution of the wave equation.
2. Prove that $(\frac{\delta}{dx} + x)(\frac{\delta}{dx} - x) = \frac{\delta^2}{dx^2} - x^2 - 1$

Q.3 (A) Attempt any TWO of the following. (16)

1. For step whose potential is described by

$$V(x) = \begin{cases} 0 & ; -\infty \leq x < 0 \quad \text{Region - I} \\ V_0 & ; 0 \leq x \leq +\infty \quad \text{Region - II} \end{cases}$$

A beam of electron, each of mass m and energy E is incident on a step potential from left to right. For $E > V_0$, derive an expression for the transmission coefficient T .

2. For rectangular potential barrier of width a and height V_0 , whose potential is

$$V(x) = \begin{cases} 0 & ; -\infty < x < 0 \\ V_0 & ; 0 \leq x \leq a \\ 0 & ; a \leq x < \infty \end{cases}$$

If energy of the incident particle E is less than the potential height V_0 , then obtain an expression for the reflection coefficient R through the barrier.

3. For square well potential whose potential is given by

$$V(x) = \begin{cases} 0 & ; -\infty \leq x \leq 0 \\ -V_0 & ; 0 \leq x < a \\ 0 & ; a \leq x < +\infty \end{cases}$$

A uniform beam of particles each of mass m and energy E is incident from left to right on a square well potential. For $E > V_0$, set up the Schrodinger time-independent wave equation for the particle and obtain its solution. Hence obtain an expression for the transmission coefficient T .

4. A particle is confined to a 3 dimensional box with sides L_x , L_y & L_z , by impenetrable walls. Show that the eigen values of the energy of the particle is

$$E_{n_x, n_y, n_z} = \frac{\pi^2 \tau^2}{2m} \left[\frac{n_x^2}{L_x^2} + \frac{n_y^2}{L_y^2} + \frac{n_z^2}{L_z^2} \right]$$

Where m is the mass of the particle and

$$n_x = 1, 2, 3, \dots, n_y = 1, 2, 3, \dots \quad \& \quad n_z = 1, 2, 3, \dots$$

(B) Attempt any ONE of the following. (4)

1. A particle of kinetic energy $E = 9 \text{ eV}$ is incident on a potential step of height $V_0 = 3 \text{ eV}$. Calculate the reflection coefficient R .

2. The wave function for the particle inside the box is

$$\Psi_{n_x, n_y, n_z}(x, y, z) = \begin{cases} D \sin n_x \pi x & \sin n_y \pi y & \sin n_z \pi z & \begin{matrix} (0 < x < L_x) \\ (0 < y < L_y) \\ (0 < z < L_z) \end{matrix} \\ L & L_y & L_z & \begin{matrix} (0 \geq x \geq L_x) \\ (0 \geq y \geq L_y) \\ (0 \geq z \geq L_z) \end{matrix} \\ 0 & 0 & 0 & \end{cases}$$

Find the value of D using normalization condition.

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

1. Where are quasars? Are all quasars radio – sources?
2. Write down success of Einstein's theory of photo electric effect.
3. The function $f(x) = 3x^2 - 1$, is on eigen function of the operator.

$$\hat{O} = -(1 - x^2) \frac{d^2}{dx^2} + 2x \frac{d}{dx}$$

Find the Eigen value corresponding to this Eigen function.

4. The Schrodinger's equation is

$$\frac{d^2\Psi(x)}{dx^2} + \frac{2m}{\hbar^2} [E - V(x)]\Psi(x) = 0$$

When $V(x) = V$ and $E > V$, show that the solution may be written as

$$\text{Where } k = \sqrt{\frac{2m(E-V)}{\hbar^2}}$$

5. Show that the transmission coefficient for rectangular potential barrier when $E > V_0$ is 1 when $a = n \left(\frac{\lambda}{2}\right)$, where a is the width of the potential barrier and $n = 1, 2, 3, 4, \dots$
6. Show that the reflection coefficient R for a step barrier for the case $E > V_0$ is given by

$$R = \left[\frac{1 - \sqrt{1 - \frac{V_0}{E}}}{1 + \sqrt{1 - \frac{V_0}{E}}} \right]^2$$

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14/03/17

S.Y BSc Regular Exam / SEM IV / Paper - I / 75:25

SSS-408

20170314

Hrs: 2½

MM : 75

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

Sub :- Botany

- 1.a. Define and classify lichens. (8)
b. Draw and describe life cycle of Erysiphe. (7)
OR
b. Explain life cycle of Pinus. (7)
- 2.a. Give an account on Xylaria. (8)
b. State general characters of class Ascomycete. (7)
OR
b. Explain disease cycle of Late blight of potato. (7)
- 3.a. Describe vegetative and asexual reproduction in Selaginella. (8)
b. Give an account on Geological Time Scale. (7)
OR
b. Explain internal structure of Selaginella Rhizophore and leaf. [7]
4. a. Explain external morphology of Pinus tree. (8)
b. Discuss the anatomical structures of root and leaf of Cordaites. [7]
OR
b. Classify Coniferophyta and state its economic importance. [7]
5. **Add a note on any three of the following. (15)**
a. Types of fossils
b. Distinguish between Psilophyta and Lepidophyta
c. Rhynia
d. RLS of Pinus stem

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15/08/17

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

Sub :- Botany

- Q1. a) Discuss weathering of soil. (8)
B Give an account of principles of mechanical tissue systems in plants with regards to girders. (7)
OR
b) Give an account of glycolysis.
- Q2.a) Describe life forms and types of life forms according to Ranunkiaer. (8) b)
Write an essay on Nitrogen cycle. (7)
OR
b) Discuss weathering of soil in detail. (7)
- Q3. a) Describe Krebs cycle. (8)
b) Write an essay on photoperiodism. (7)
OR
b) Discuss photorespiration. (7)
- Q4. a) Discuss different types of vascular bundles in detail. (8)
b) Give an account secondary growth in stems. (7)
OR
b) Give an account of phloem. (7)
- Q5. WRITE SHORT NOTES (ANY THREE) (15)
a) Vernalization
b) Types of soil
c) Biological nitrogen fixation
d) Phytochrome and its role
e) Biomass

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16/03/17

Sy BSc Regular Exam / Sem IV / Paper III / 75:25

SSS-412

20170316

Hrs: 2 1/2

MM : 75

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

Sub :- Botany

- 1 a. Give detailed account on techniques in plant tissue culture. [8]
 b. Give an account on Jijamata Udyan. [7]

OR

- b. Find χ^2 value. Table value of χ^2 : 0.05 is 7.82. [7]

Red Ebony	Wild type	Red	Ebony
68	62	1790	1812

2. a. Explain any four garden locations studied by you and give suitable examples. [8]
 b. Explain in detail Sanjay Gandhi National park. [7]

OR

- b. What is Horticulture? Explain its branches in detail. [7]

3. a. What is totipotency? Explain its significance, b. Explain enzymes involved in gene cloning.

OR

- b. What are vectors? Give its types and explain pBR322 in detail. [7]

4. a. Find coefficient by Spearson's Rank method [8]

English (X)	8	36	98	25	82	92	62	65	35	75
Hindi (Y)	84	51	91	60	62	86	58	35	49	68

- b. Calculate χ^2 value. Table value of χ^2 at 3df = 7.82 [7]

Plant	1	2	3	4
Yellow seed	25	32	14	70
Green seed	11	7	5	27

OR

- b. Describe BLAST in detail. [7]

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

- a. Lambda phage and PUC18
 b. Bioinformatics - scope & limitation
 c. Enzymes involved in gene cloning
 d. Anther culture

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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) Show that if the limit of a scalar valued function exists at a point then the limit is unique.
- (b) State and prove the mean value theorem for derivatives of scalar fields.

Part B: Attempt any THREE questions.

(12 marks)

- (c) If $f(x, y) = \frac{xy}{x^2+y^2}$,
Does $\lim f(x, y)$ exist as $(x, y) \rightarrow (0, 0)$?
- (d) Examine the continuity of $f(x, y) = \frac{x+y}{x-y}$, if $(x, y) \neq (0, 0)$
 $= 0$, otherwise.
- (e) Check the convergence of the sequences
$$X_n = \left(\frac{3n+4}{4n^2+5}, \frac{4n^2}{3n^2+1}, (-1)^n \right)$$
- (f) If $f(x, y) = x^4 + 2x^2y + 3xy^2 + 4x$
Find f_x and f_y at $(1, -1)$.

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

(08 marks)

- (a) Show that if f is differentiable at a with total derivative T_a then $f^1(a; u)$ exists and $T_a(u) = f^1(a; u)$ for every $u \in \mathbb{R}^n$.
- (b) If $f^1(a; u)$ exists on a scalar field for some $u \in \mathbb{R}^n$ then show that f is continuous at a .

Part B: Attempt any THREE questions.

(12 marks)

(c) Find the gradient of

$$f(x, y) = \frac{x^2}{2} - \frac{y^2}{4} + xy^3 - x^3y \text{ at } (-3, 2).$$

(d) Find the equation of the tangent plane to the surface

$$z = \frac{x^2}{4} + y^2 + \frac{z^2}{9} \text{ at } (-2, 1, -3)$$

(e) If $u = x^3y + e^{xy^2}$, show that $U_{xy} = U_{yx}$.

(f) Find the level curves of $f(x, y, z) = 100 - x^2 - y^2 - z^2$

For $c = 0; c = 51, c = -96$.

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

(08 marks)

(a) Find the extremum values of $f(x, y) = 4x^2 - 6xy + 5y^2 - 20x + 26y$

(b) State and prove the mean value inequality of vector fields.

Part B: Attempt any THREE questions.

(12 marks)

(c) Find Taylor's polynomial of degree 2 at (0,0) for

$$f(x, y) = \sin x \sin y.$$

(d) Find the linearization of $f(x, y, z) = \log(x - 3y + z)$ at (7, 2, 0).

(e) If $z = e^x \sin y$, Where $x = s^2t; y = st^2$, find $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$

(f) If $f: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ is a function defined by

$$f(x, y, z) = (x + 2y^2, y + 2x^2, x + z^2y),$$

Find the Jacobian matrix of f at (2, 1, -3).

Q(4) Part A: Attempt any THREE questions from the following.

(15 marks)

(a) Prove that (i) $|\alpha x| = |\alpha| |x|$

$$(ii) |x + y| \leq |x| + |y|$$

(b) Find the directional derivative of

$$f(x, y, z) = x^2 - 2y^2 - 3z^2 \text{ at } (1, -2, 1) \text{ in the direction of } \vec{u} = \frac{1}{\sqrt{3}}(\vec{i} + \vec{j} + \vec{k}).$$

(c) if $u = x^2y + y^2z + z^2x$, show that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 2(x + y + z)$

(d) If $u = xe^{x/z}$ where $x = t^2; y = 1 - t; z = 1 + 2t$, find $\frac{du}{dt}$ at $t = 0$.

(e) Find the total derivative of $f: \mathbb{R}^3 \rightarrow \mathbb{R}^4$ defined by

$$f(x, y, z) = (x + y^2, x^2 + z, y + z^2, xyz) \text{ at } (-3, 1, -2).$$

(f) Using Lagrange multipliers & method find the points on the

Ellipse $x^2 + 2y^2 = 1$ where $f(x, y) = xy$ has its extreme values.

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11/03/17

S.Y BSc Regular Exam / Paper II / Sem IV / 75:25

SSS-403

20170310

Hrs: 2½

MM : 75

Sub:- Maths

- Note: (1) All questions are compulsory.
 (2) Figures to the right indicate full marks.
 (3) Use of calculator is not allowed.
 (4) G denotes a group with the binary operation and H, K denote the subgroups of G where as a, b, c denote elements in G unless otherwise stated.

Q.1 A) Attempt any one.

8

- (i) Prove that $a^m = a^{m+n}$ for $m, n \in \mathbb{Z}$
 (ii) Prove that, union of two subgroups of G is a subgroup of G iff one is contained in the other.

B) Attempt any three.

12

- (i) Prove that, if $(a.b)^2 = a^2 . b^2$, for any a, b in G then G is abelian.
 (ii) Prove that, the inverse of an element in G is unique.
 (iii) Prove that, $Z(G) = \{x \in G / x.a = a.x, \forall a \in G\}$ is a subgroup of G .
 (iv) Prove that, if $O(a) = n$ then $a^m = e$ iff n divides m .

Q.2 A) Attempt any one.

8

- (i) If G is cyclic prove that the subgroup H is also cyclic.
 (ii) If G be cyclic group of order pn where p is prime, prove that $H \subseteq K$ or $K \subseteq H$.

B) Attempt any three.

12

- (i) Prove that, if G is cyclic then G is abelian.
 (ii) Prove that, if G is infinite then it has exactly two generators.
 (iii) Prove that, if G is infinite then H is also infinite.
 (iv) If G has no nontrivial subgroups then G is cyclic group of prime order.

Q.3 A) Attempt any one.

8

- (i) Prove that, G is the union of all left cosets of H in G and any two left cosets of H in G are either identical or disjoint.
 (ii) If $(G', *)$ is a group and $f: G \rightarrow G'$ is an isomorphism, prove that, G is cyclic iff G' is cyclic.

- B) Attempt any three.**
- (i) Let $a \in G$. Prove that, $a \in H$ iff $a \in H$.
 - (ii) Prove that, the number of left cosets of H in G is equal to number of right cosets of H in G .
 - (iii) Prove that, if $(G', *)$ is a group and $f: G \rightarrow G'$ is a homomorphism then $\text{Ker. } f = \{a \in G / f(a) = e'\}$ is a subgroup of G .
 - (iv) If $(G', *)$ is a group and $f: G \rightarrow G'$ is a homomorphism then prove that, $f(e) = e'$, where e and e' are identity elements in G and G' respectively.

- Q.4 Attempt any three.**
- (i) Prove that, $HK = \{h.k / h \in H \text{ and } k \in K\}$ is a subgroup of G iff $HK = KH$.
 - (ii) Verify whether the set $\{1, -1, i, -i\}$ is a group with the operation 'multiplication'.
 - (iii) Prove that, if $a \in G$ and $H = \{a^n / n \in \mathbb{Z}\}$ then H is a smallest subgroup of G containing a .
 - (iv) Prove that, a finite group of order n is cyclic iff it contains an element of order n .
 - (v) If $a \in G$, prove that, $Ha = Hb$ iff $a.b^{-1} \in H$.
 - (vi) If $(G', *)$ is a group and $f: G \rightarrow G'$ is a homomorphism then prove that, $\text{Ker. } f = \{e\}$ iff f is one-one, where e is an identity elements in G .

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

Sub:- Maths

75:25

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

(08 marks)

(1) Solve the differential equation $\frac{dy}{dx} + \left(\frac{1}{x}\right)y + xy^3$

OR

(2) Solve the differential equation $(x^2 - 2x + 2y^2)dx + (2xy)dy = 0$

Part B: Attempt any THREE questions.

(12 marks)

(1) Solve the following d.e $(x^4 e^x + 4xy^2)dx + 4x^2 y dy = 0$

(2) Solve the d.e $xy^3 \frac{dy}{dx} = 1 - x^2 + y^2 - x^2 y^2$

(3) Solve $(1 + x^2) \frac{dy}{dx} = y = e^{\tan^{-1} x}$

(4) Solve $xydx - (x^2 + 2y^2)dy = 0$

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

(08 marks)

- (1) Show that
- $y = c_1 x + c_2 x^2$
- is the general solution of
- $x^2 y^4 - 2xy^1 + 2y = 0$
- on any interval not containing zero and find that particular solu for which
- $y(-1) = 3$
- &
- $y(1) = 5$
- .

OR

- (2) Find the particular solution using method of variation of parameter

$$y^4 - 6y^1 + 9y = \frac{e^{3x}}{x}$$

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

(1) Show that e^{-2x} and e^{3x} are solutions of the equation $y'' - y' - 6y = 0$.

Hence find the general solution.

(2) Using one solution, find the other solution.

$$xy'' - y' + 4x^3y = 0, y_1 = \cos(x^2)$$

(3) Find the general solution of the following $y'' = 2y' + y = 0$

(4) Show that \sqrt{x} and $\frac{1}{x}$ are solutions of the equation $2x^2y'' + 3xy' - y = 0$

Q(3) Part A: Attempt any ONE questions. (08 marks)

(1) Use Taylor's method to solve the equation $y' = x^2 + y^2$ for $x = 0.25$

And $x = 0.5$ given $y(0) = 1$

OR

(2) Solve the following equation $y' = x + y + xy$ given $y(0) = 1$ using Hen's method estimate $y^{(1)}$ taking $h = 0.25$.

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

(1) Use Picard's method to solve the following differential equation

$$\frac{dy}{dx} = x^2y + y, y^{(1)} = 2 \text{ at } x = 0.5 \text{ \& } x = 1.5$$

Take only one approximation.

(2) Solve the following differential equation by Euler's method for $y^{(1)}$

$$\frac{dy}{dx} = 2xy \text{ \& } y(0) = 1 \text{ for } h = 0.25$$

(3) Using Taylor's services method, find $y(0.1)$ given $\frac{dy}{dx} = x^2y - 1, y(0) = 2$.

(4) Find $y(0.1)$ given $\frac{dy}{dx} = y - x, y(0) = 2$ taking $h = 0.1$ using Runge Kutte method.

Q(4) Part A: Attempt any THREE questions from the following.

(15 marks)

- (1) Solve $e^{x^2}y + y^2x = 0$
- (2) Solve $y(1 + xy)dx + x(1 - xy)dy = 0$
- (3) Find the general solution of the equation $y'' + y = 0$
- (4) Find a particular solution of $y'' + 2y' + y = e^{-x \log x}$ by the method of variation of parameter.
- (5) Explain Heun's method to solving the equation $y'(x) = f(x, y)$
- (6) Solve the differential equation $y' = \frac{z}{y}$ for $y^{(1)}$
Given $y(0) = 1$ for $h = 0.25$ using eulers formula.

=====

- Note: 1. All questions are compulsory
2. Non programmable calculators are allowed to use.
3. Figures to right indicates full marks

Chemistry

Q.1 Attempt any four from the followings—

- a) Explain the term 'migration of ions' with suitable examples and experimental verification. (5)
- b) Show that equivalent number of ions is discharged at each electrode in spite of difference in the speed of the ions. (5)
- c) In a moving boundary method with a solution of KCl 1 mol/dm³ using CdCl₂ as indicator, a current of 0.012 ampere was passed for 1800 seconds. The boundary moved a volume of 0.1 cm³, calculate the transport number of K⁺ ions. (5)
- d) Define and explain the term ionic mobility. (5)
- e) Explain the terms 'mass defect' and 'binding energy'. Derive the relation between them. (5)
- f) Calculate the mass defect, binding energy and binding energy per nucleon for ⁵⁶Fe. If the isotopic mass of Fe is found to be 55.9349 a.m.u. Given mass of hydrogen atom is 1.0078 a.m.u. and mass of neutron is 1.0086 a.m.u. (5)
- g) How surface tension is measured by liquid drop method? (5)
- h) Describe the method to measure viscosity of liquid. (5)

Q.2 Attempt any four from the followings—

- a) State Gibb's phase rule and explain the meaning of terms involved. (5)
- b) Explain positive and negative deviation from Raoult's law of vapour pressure. (5)
- c) Explain, upper consolute temperature with suitable example. (5)
- d) State and derive mathematical expression for Lambert's Law. (5)
- e) State advantages and limitation of photometric titration. (5)
- f) Write a note on photovoltaic cell. (5)
- g) An aqueous solution of a species having 1.2 x 10⁻⁴M concentration absorbs 20% of the incident radiation in a path length of 1 cm. Calculate the absorbance of the solution, molar absorptivity of the solution. (5)

- h) A transmittance of a $2 \times 10^{-4} \text{M}$ solution of a substance was found to be 76.2% at a wavelength of 350 nm, when placed in a cell of 1 cm length. Calculate the absorbance, molar absorptivity and the percent transmittance.

Q.3 Attempt any four from the followings—

- a) Differentiate between determinate and indeterminate error. (5)
- b) Explain the terms mean and median with suitable example. (5)
- c) The pH of a solution was found to be 4.50, 4.53, 4.55, 4.51, 4.57 and 4.52. Calculate the standard deviation, variance and coefficient of variation for the set of observations. (5)
- d) Discuss constant and proportionate errors. (5)
- e) Find the range, mean, median, average & relative deviation from the median from the data given below—

Chlorine (ppm)	9.9	9.7	10.1	9.6	9.5
Sample No.	1	2	3	4	5

- f) What is meant by precision and accuracy? Distinguish between the two. (5)
- g) Discuss precipitation titration curve with suitable example. (5)
- h) Calculate ionic product (p_{Cl}) for the solution, when 2 cm^3 ; 4 cm^3 ; 5 cm^3 and 10 cm^3 of 0.1M AgNO_3 solution is added successfully in the conical flask containing 10 cm^3 of 0.1M NaCl solution. (5)

Q.4A) State whether the following statement is True or False. (5)

- 1) The homogeneous mixture of two or more components is termed as ideal solution.
- 2) The liquid having high boiling point always shows very high vapour pressure.
- 3) Under the influence of an applied electric field, the cations present in an solution migrate towards cathode.
- 4) The sum of transport number of the cation and anion present in solution is always one

5) The transport number of an ion is inversely proportional to charge density.

Q5) Match the Column

Column A	Column B
Transmittance	$\frac{l_t}{l_0}$
Surface Tension	Fraction of the current carried by an ion
Coefficient of Viscosity	Stalpmometer
Current	Total quantity of charge transferred per unit time
Ionic mobility	Ostwald's Viscometer
Transport Number	Structural determination
Cation	Under the influence, migrate towards cathode
Weighing a hot crucible	Operational error
Water + nicotine	Ideal solution
Raoult's law	Partially miscible with upper and lower CST.

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Note: 1. All questions are compulsory and carry equal marks.

2. Figures to right indicates full marks

3. Figures to right indicates full marks

Sub :- Chemistry

Q.1 ATTEMPT ANY 4 QUESTIONS 5 marks each.

1. What is co-ordination number. List the different evidences which indicate the formation of a complex compound.
2. On the basis of the VBT explain the geometry and magnetic properties of the following complexes.
i) Nickel tetracarbonyl ii) ironpentacarbonyl
- 3.i) What are the characteristics of co-ordination compounds.
ii) With reference to co-ordination compounds discuss linkage isomerism and solvent isomerism giving any one example.
4. On the basis of the VBT explain the geometry and magnetic properties of the following complexes.
i) $[\text{NiCl}_4]^{2-}$ ii) $[\text{PtCl}_4]^{2-}$
5. Define the term LIGAND. List the biological applications of co-ordination compounds.
6. What are the sources of iron and potassium. What is their role in the biological system.
7. NAME AND Calculate the EAN for the following complexes.
i) $\text{Fe}(\text{CO})_5$ ii) $\text{Cr}(\text{CO})_6$
8. What are the functions of the following in the biological system
i) sodium ii) copper iii) myoglobin.

Q.2 ATTEMPT ANY 4 QUESTIONS 5 marks each

1. Draw the structure of
 - i. salicylaldehyde
 - ii. Naphthalene-1-aldehyde
 - iii. o-hydroxy benzoic acid
 - iv. p-toluic acid
 - v. benzene-1,2 dicarboxylic acid

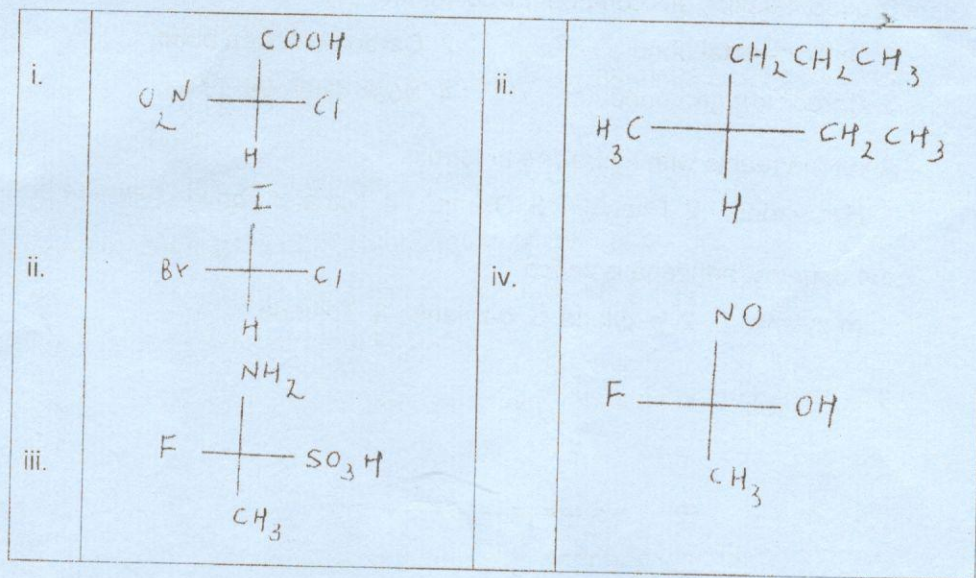
2. Write reactions to show the conversion of
- benzyl alcohol to an benz aldehyde.
 - benzoyl chloride to benzaldehyde
 - benzene to benzaldehyde
 - acetylene to an aldehyde
 - 1- propyne to a ketone
3. Two moles of acetaldehyde react in the presence of a strong base. Name the reaction involved and write the correct mechanism.
4. How is benzoic acid prepared using solid carbon dioxide. Convert benzoic acid to
- benzamide
 - benzoyl chloride
 - sodium benzoate
5. List any five properties of metal carbonyls.
6. What are organometallics. Classify with one example. Give any two uses.
7. How are the following acids synthesized
- o- hydroxyl benzoic acid
 - benzoic acid from toluene
 - phthalic acid from o-xylene
8. Convert
- cyano benzene to benzoic acid
 - ethyl acetate to a tertiary alcohol.

Q3(A) ATTEMPT ANY 4 QUESTIONS

5 marks each.

- 1.a) Define tautomerism. Draw the keto and enol form of 2- propanone.
- b) → How does ammonia react with formaldehyde and acetone . Name the products formed.
2. Explain the foil. Reactions with one example
- Diazotization
 - Gomberg reaction
 - Azo coupling reaction
 - Sandmeyer reaction
 - Amination
3. What is Stereochemistry. Draw the Newmann projection formula for ethane and n- butane. Which of the structures is more stable and why?

4. What is acetylation. How does aniline undergo acetylation in the presence of different reagents. Name the products formed.
5. Give synthesis and one use of,
 i) Methyl orange
 ii) Orange II.
6. Assign the R or S nomenclature to the following structures



7. Write a short note on stereochemistry of Di-substituted cyclobutane.
8. Explain the knoevenagel reaction with two examples and mechanism.

Q.4(A) COMPLETE THE FOLLOWING :

1 mk each

- i. One example of an essential element is _____
- ii. One example of a non-essential element is _____
- iii. One biological function of metalloenzymes is _____
- iv. Any one example of an inner complex salt is _____
- v. One example of a single salt is _____

B) MATCH THE COLUMNS:

1 mk each

1.	Primary AMINE	A	CHROMOPHORE
2.	TERTIARY AMINE	B	fumaricacid
3.	Trans isomer	C	maleic acid
4.	AZO GROUP	D	dimethyl aniline
5.	Cis isomer	E	aniline

C) **SELECT THE CORRECT OPTION:** 1 mk each.

- i) The FG of salicylic acid
1. -OH and -COOH 2. -CHO 3. -OH 4. -OH and -CHO.
- ii) The FG of anthranilic acid are
1. -NH₂ and -COOH 2. -CHO 3. -OH 4. -OH and -CHO.
- iii) Organometallics are compounds containing the
1. Carbon-metal bond 2. Carbon-nitrogen bond.
3. Carbon-oxygen bond 4. None of above
- iv) A ketone reacts with hydrazine to form a
1. Hydrazone 2. Phenol 3. Oxime 4. None of above.
- v) 1,4 dimethyl benzene is called
1. m-xylene 2. p-xylene 3. o-xylene 4. Toluene.

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Note: 1. All questions are compulsory.

2. Figures to right indicates full marks

SYBSC Sem-III Reg
Chem-III

- Q.No.1** **Attempt any four** **20M**
- A. Explain solvent extraction process of obtaining an Oil? Give the flow diagram?
- B. Discuss the electrochemical theory of corrosion
- C. Explain the factors which influences corrosion?
- D. Explain i) Anodic protection ii) metal coatings for protection of metals from corrosion
- E. What is difference between oils and fats? Give examples?
- F. How is soap manufactured by batch process? Give the flow diagram
- G. Explain Hydrogenation of Oils with example?
- H. How is Glycerol recovered from the spent lye?
- 11/03/2017

- Q.No.2** **Attempt any four.** **20M**
- A. Describe froth flotation process?
- B. Discuss about the toxicity and Antidote of As and Hg?
- C. Discuss the toxicity of non metals like Sulphur and Nitrogen?
- D. Write short notes on Minimata Disaster
- E. Define Metallurgy? What are the different types of metallurgy?
- F. Explain the physicochemical principles involved in self reduction process?
- G. What are different ways of refining impure metal? Explain them in brief?
- H. Describe in brief metallurgy involved in manufacture of Copper?

- Q.No.3** **Attempt any four.** **20M**
- A. Explain What is water Pollution?
- B. Mention and discuss various types of water pollution?
- C. Discuss briefly, the different effects of water pollution?
- D. Discuss the Primary and secondary treatment of waste water?
- E. What are the different steps involved in waste water treatment?
- F. Describe the role of an individual with reference to water pollution and its prevention?
- G. What are the powers of state Board on disposal of pollutants?
- H. Write in brief about Ganga Action Plan?

Q.No.4

Attempt All

15M

1-

Fill in the Blanks

5M

1-

Match the columns

No.	column 'A'	Column 'B'
1.	Carbon monoxide poisoning	a) Effect on immune system
2.	Benzene Poisoning	b) Reversible process
3.	Change in Body temperature	c) Irreversible process
4.	Convulsions, coma	d) Cyclic process
5.	Allergies	e) Physiological effects

II

Multiple choice question

10M

Q.1

Argentite

- A. AgCl
- B. AgI
- C. AgBr
- D. Ag₂S

Q.2.

copper is prepared by

- A. Pyrometallurgy
- B. Hydrometallurgy
- C. Electrometallurgy
- D. All the three

Q.3

Water is treated with chlorine to:

- A. Increase oxygen content
- B. Cause sedimentation
- C. Kill Germs
- D. Remove insoluble impurities

Q.4.

corrosion is

- A. reverse oxidation
- B. reverse reduction
- C. oxidation and reduction
- D. reverse metallurgy

5. **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
6. **Copper pyrite is**
- A. CuFeS_2
 - B. CuS_2
 - C. CuO_2
 - D. All the three
7. **lead poisoning can be cured by**
- A. Calcium salt of EDTA
 - B. Oxygen
 - C. Dimercaptopropanol
 - D. Dimercapto Succinic acid
8. **Blood pressure and cardiac activity is disturbed by excess of:**
- A. Arsenic
 - B. Iron
 - C. Cadmium
 - D. Sodium
9. **BOD value less than 5 ppm indicates water sample**
- A. Rich in dissolved oxygen
 - B. Highly polluted
 - C. Poor in dissolved oxygen
 - D. Not suitable for aquatic life
10. **Saponification is**
- A. Acid hydrolysis
 - B. Basic Hydrolysis
 - C. CrystallisationEnzyme hydrolysis
 - D. Any of the above

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

1. Write a detailed note on RTI.

OR

1. Write a note on Public Interest Litigation. Explain the need to file Public Interest Litigation? [15]

2. Explain the importance of Eco-Feminism and Eco Spirituality. [15]

OR

2. Discuss in detail Polluters Pays Principles. What are the issues involved in fair share of carbon space?

3. What is meant by ICT? Write a note on application of IT. [15]

OR

3. What is meant by biotechnology? Explain the application of biotechnology?

4. What are the issues in managing our time ? What are the effective strategies for time management? [15]

OR

4. Explain the concept of motivation. What are the different types of motivations?

5. **Write short notes on (any 03)** [15]

- a. Traffic Congestion.
- b. Social Tension.
- c. Causes of Urbanisation in India.
- d. Affordable housing.
- e. 8Rs of waste management.
- f. Affordable housing.
- g. Social tensions.

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