This question paper contains **3** printed pages]

1001—2024

FACULTY OF ALL

B.A./B.Com./B.Sc. (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

ENVIRONMENTAL STUDIES (Compulsory)

पर्यावरण अभ्यास (अनिवार्य)

(Wednesday, 03-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *all* questions.

(*ii*) Illustrate your answer with suitable labelled diagram wherever necessary.

(*i*) **सर्व** प्रश्न सोडवा.

(*ii*) आवश्यकता असेल तेथे आकृती काढून नावे घ्या.

1. Write in detail non-renewable resources. 15

क्षयक्षम साधन संपत्ती बद्दल सविस्तर माहिती लिहा.

P.T.O.

Or

(किंवा)

(A) Define ecosystem and explain grassland ecosystem. 8

परिसंस्था म्हणजे काय ? गवताळ परिसंस्थे बद्दल माहिती द्या.

(B) Describe conservating of biodiversity. 7

जैवविविधतेचे संवर्धन बद्दल वर्णन करा.

2. Define air pollution. Describe its sources, effects and control measures. 15

'हवा प्रदूषण म्हणजे काय ? हवा प्रदूषणाची कारणे, परिणाम व नियंत्रण ह्या बद्दल माहिती विशद करा.

Or

(किंवा)

(A) What is ecological successing ? 8

परिस्थितीक अनुक्रम म्हणजे काय ?

(B) Values of biodiversity. 7

जैवविविधतेचे मूल्य.

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

(*a*) Draught

(*b*) Soil erosion

(*c*) Pond

(*d*) Food Web.

थोडक्यात टिपा लिहा (कोणतेही **दोन**) :

(अ) दुष्काळ

(ब) जमीनीची धुप

(क) तळे

(ड) अन्न जाळे.

This question paper contains **2** printed pages]

PA—22—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

PHYSICS

Paper XII

(Qunatum Mechanics)

(Friday, 12-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) *All* questions are compulsory.

(*ii*) Each symbols have their own usual meaning.

(*iii*) Given :

(*a*) Charge of electron (e) = 1.6×10^{-19}C

(*b*) Mass of electron (m) = 9.1×10^{-3}kg

(*c*) Planck's constant (h) = 6.6205×10^{-34} J.s.

1. State and explain Heisenberg's uncertainty principle with any *one* suitable application. 15

P.T.O.

Or

(*a*) Explain Schrodinger's time dependent wave equation and show that : 8

$$H\Psi = E\Psi.$$

(*b*) Explain quantum mechanical operators and describe momentum operator. 7

2 Derive an expression for energy of a particle in three-dimensional box. 15

Or

(*a*) What is quantum number for H-atom ? Explain principle quantum number. 8

(*b*) Obtain an expression for Schrodinger wave equation of hydrogen atom. 7

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

(*a*) Quantum theory of light

(*b*) Eigen value and eigen function

(*c*) Particle in one-dimensional box : momentum quantization

(*d*) Oribtal quantum number.

This question paper contains **2** printed pages]

PA—35—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

PHYSICS

Paper XIII

(Solid State Physics)

(Monday, 15-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. Explain in detail translation, rotation, reflection and inversion operations. 15

Or

(*a*) Explain in brief hydrogen bonding and van der Waals' bonding.

(*b*) What is Bragg's law ? Describe in detail Bragg's equation.

P.T.O.

2 Derive an expression for Einstein's theory of heat capacity and explain its variations at low and high temperatures. 15

Or

(*a*) Discuss the thermionic emission and escape of electrons from metals. 8

(*b*) Explain in detail thermal conductivity of solids. 7

3. Attempt any *two* : 10

(*i*) Write a short note on point group symmetry

(*ii*) Explain the phenomenon of X-ray diffraction.

(*iii*) Describe the limitations of the Debye model.

(*iv*) Enlist the outstanding properties of metals.

This question paper contains **3** printed pages]

PA—04—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

CHEMISTRY

Paper XII

(Organic and Inorganic Chemistry)

(Friday, 05-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Figures to the right indicate full marks.

1. Solve any *three* of the following : 3×5=15

(*a*) Define ligands. Give their classification on the basis of denticity.

(*b*) What is complex ion ? How does Werner's theory of co-ordination compound account for ionic nature of the complex $CoCl_3.6NH_3$?

(*c*) Describe Rubidium complexes used for the treatment of cancer.

(*d*) What is EAN ? Calculate EAN of the central metal ion in the following complexes and write their IUPAC names; $[Ni(CO)_4]$ and $[Cu(CN)_4]^{3-}$.

(*e*) Write a short note on anti-arthritis drugs.

P.T.O.

2. Solve any *three* of the following : 3×5=15

(*a*) Give preparation of Furan from :

(*i*) Mucic acid

(*ii*) Succinaldehyde.

What is the action of the following on Furan ?

(*i*) $HNO_3/(CH_3CO)_2O$

(*ii*) $2H_2$/Raney Ni

(*b*) What are dyes ? Give qualities of a good dye. Explain synthesis and uses of methyl orange.

(*c*) What are chemotherapeutic agents ? Explain :

(*i*) Antibacterials

(*ii*) Antifungals

(*iii*) Anaesthetics with suitable example.

(*d*) What happens when pyridine is reacted with the following reagents?

(*i*) $NaNH_2$

(*ii*) $HNO_3 + H_2SO_4$

(*iii*) Br_2/charcoal at 300°C.

(*e*) What are alkaloids ? Give general properties of alkaloids.

3. Solve any *two* of the following : 2×5=10

(*a*) Explain what happens when :

(*i*) Furan is reacted with mixture of CO and HCl in the presence of $AlCl_3$.

(*ii*) Pyrrole is reacted with SO_3 in presence of Pyridine.

(*iii*) Thiophene is reacted with $HgCl_2/CH_3COONa$.

(*b*) Write short notes on any *three* of the following :

(*i*) Tocopherols

(*ii*) Thiamine

(*iii*) Retinol

(*iv*) Vitamin C

(*v*) Ergocalciferol.

(*c*) What are pesticides ? Give synthesis and uses of :

(*i*) Chloranil

(*ii*) Alachlor.

(*d*) Write a short note on pharmacodyanamic agents.

This question paper contains **2** printed pages]

PA—11—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

CHEMISTRY

Paper-XIII

(Physical and Inorganic Chemistry)

(Monday, 08-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Use logarithmic table and non-programmable calculator is allowed.

1. Answer any *three* of the following : 3×5=15

(*a*) Explain polymerization of W^{6+}.

(*b*) Draw the structure of CrO_4^{2-} tetrahedral heteropoly anion.

(*c*) Explain the structure of isopoly anions of Mo^{6+}.

(*d*) Draw and explain the structure of $Ir(CO)_{12}$.

(*e*) Define isolobal fragments and explain P_4 fragment.

P.T.O.

2. Solve any *three* of the following : 3×5=15

(*a*) Derive the Ilkovic equation for the diffusion current in a polarographic cell.

(*b*) Describe in brief any *two* applications of Polarography.

(*c*) Define magnetic susceptibility, specific susceptibility and give their units.

(*d*) State and explain Raoult's law for vapour pressure of binary solutions of volatile liquids.

(*e*) Derive Gibbs-Duhem-Margules equation.

3. Answer any *two* of the following : 2×5=10

(*a*) Derive an expression for chemical potential for ideal solution.

(*b*) Derive an expression for free energy change of mixing of an ideal solution.

(*c*) Explain the effect of temperature on paramagnetic, diamagnetic and ferromagnetic substances.

(*d*) Explain the principle of Polarography.

This question paper contains **3** printed pages]

PA—10—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(New/CBCS Pattern)

CHEMISTRY

Paper : XIII (B_1)

(Physical and Inorganic Chemistry)

(Monday, 08-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use logarithmic table and non-functional calculator is allowed.

1. Answer any *three* of the following : 3×5=15

(*a*) Write down any *two* methods for preparation of ferrocene and explain the aromaticity of ferrocene by giving suitable chemical reaction.

(*b*) Write down methods of preparation and properties of organolithium compounds.

(*c*) (*i*) Explain the transition metal organometallic compound with its examples.

(*ii*) Write a short note on nomenclature of simple and mixed organometallic compounds.

P.T.O.

(*d*) Discuss the methods for preparation of $Ni(CO)_4$ and explain the structure.

(*e*) (*i*) Draw the structures of $Fe_2(CO)_9$ and $Ir_4(CO)_{12}$.

(*ii*) Describe mononuclear metal carbonyl with examples.

2. Answer any *three* of the following : 15

(*a*) State and explain factors affecting the width of spectral lines.

(*b*) State and explain Nernst distribution law and give its limitation.

(*c*) Derive the equation for the rate constant of third order reaction.

(*d*) The pure rotational spectrum of HCl gaseous molecule consist of series of equally spaced lines separated by 18.60 cm^{-1}. Calculate internuclear distance of the molecule, if the reduced mass is 1.55×10^{-27} kg.

$h = 6.626 \times 10^{-34}$ JS

$c = 3 \times 10^8$ ms^{-1} and $1\ cm^{-1} = 10^2\ m^{-1}$

(*e*) Explain Raman effect. What is Raman shift ?

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

(*i*) Explain principle and theory of vibrational spectra.

(*ii*) State and explain Franck-Condon principle.

(*iii*) Explain the kinetics of reversible reaction.

(*iv*) When an organic acid was shaken with mixture of benzene and water at constant temperature, the following results were obtained. conc mole/ wt.

Conc. of acid in benzene : C_1 0.036, 0.048, 0.060

Conc. of acid in water : C_2 0.12, 0.16, 0.20.

Comment on result.

This question paper contains **2** printed pages]

PA—177—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

INDUSTRIAL CHEMISTRY

Paper XII

(Unit Processes in Organic Synthesis)

(Saturday, 04-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— Use of scientific calculator is allowed.

1. Explain polymerization process and explain synthesis of high pressure polyethylene process with neat labelled diagram. 15

Or

(*a*) Explain synthesis of Nylon 6, Nylon 66 with suitable reaction mechanism. 8

(*b*) Explain synthesis of Bakelite with neat labelled diagram. 7

2. Explain nitration process and explain kinetics and mechanism of aromatic nitration. 15

P.T.O.

Or

(*a*) Explain N-Nitro compounds and nitrates esters. 8

(*b*) Explain Buzzinitrator with neat labelled diagram. 7

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

(*a*) Photochlorination

(*b*) DVS calculation

(*c*) Iodination

(*d*) Solution polymerization.

This question paper contains **2** printed pages]

PA—237—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New)

INDUSTRIAL CHEMISTRY

Paper XIII

(Process Equipment Design, Process Instrumentation)

(Friday, 10-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— Solve *all* questions.

1. Explain column internal detail with neat diagram. 15

Or

(*a*) What do you mean by allowable deflection ? Write in detail. 8

(*b*) Explain types of distillations. (any *three*) 7

2. Explain in detail factors influencing to corrosion and preventing corrosion. 15

Or

(*a*) What is agitator ? Explain in detail *four* types of agitator. 8

P.T.O.

(*b*) Give the classification of reaction vessel and explain in detail. 7

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

(*a*) U-tube manometer

(*b*) Radiation and pyrometer

(*c*) Bourdon tube

(*d*) Capsule type sensors.

This question paper contains **2** printed pages]

PA—237—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New)

INDUSTRIAL CHEMISTRY

Paper XIII

(Process Equipment Design, Process Instrumentation)

(Friday, 10-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— Solve *all* questions.

1. Explain column internal detail with neat diagram. 15

Or

(*a*) What do you mean by allowable deflection ? Write in detail. 8

(*b*) Explain types of distillations. (any *three*) 7

2. Explain in detail factors influencing to corrosion and preventing corrosion. 15

Or

(*a*) What is agitator ? Explain in detail *four* types of agitator. 8

P.T.O.

(*b*) Give the classification of reaction vessel and explain in detail. 7

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

(*a*) U-tube manometer

(*b*) Radiation and pyrometer

(*c*) Bourdon tube

(*d*) Capsule type sensors.

This question paper contains **3** printed pages]

PA—50—2024

FACULTY OF ARTS/SCIENCE

B.A./B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

MATHEMATICS

Paper–XII

(Metric Spaces)

(Thursday, 18-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions

(*ii*) Figures to the right indicate full marks.

1. Prove that every compact subset F, of a metric space (X, *d*), is closed. 15

Or

(*a*) Let (X, *d*) be any metric space. Prove that a subset F, of X, is closed if and only if it's complement in X is open. 8

P.T.O.

(*b*) Show that the function $d : R \times R \to R$ defined by $d(x, y) = |x - y|$; for all $x, y \in R$ is a metric on the set R of all real numbers. 7

2. Let Y be a subset of a metric space (X, d), then prove that the following are equivalent : 15

(*i*) Y is connected

(*ii*) Y cannot be expressed as disjoint union of two non-empty closed sets in Y.

Or

(*a*) Let (X, d) be a complete metric space and Y be a subspace of X, then prove that Y is complete if any only if it is closed in (X, d). 8

(*b*) Let (X, d_1) and (Y, d_2) be two metric spaces. Show that $f : X \to Y$ is continuous if and only if $F\left(\overline{A}\right) \subseteq \overline{F(A)}$, for every $A \subseteq X$. 7

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

(*a*) Let (X, d) be any metric space. Show that the function d_1 defined by

$$d_1(x, y) = \frac{d(x, y)}{1 + d(x, y)}.$$

For all $x, y \in X$ is a metric on X.

(*b*) Prove that every compact subset A, of a metric space (X, *d*), is bounded.

(*c*) Prove that every convergent sequence is a Cauchy sequence.

(*d*) Discuss the connectedness of the subset :

$$D = \left\{(x, y) \mid x \neq 0,\ y = \sin\left(\frac{1}{x}\right)\right\}$$

of the Euclidean space R^2.

This question paper contains **2** printed pages]

PA—63—2024

FACULTY OF ARTS/SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

MATHEMATICS

Paper XIII

(Linear Algebra)

(Saturday, 20-4-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. State and prove the Rank-Nullity Theorem. 15

Or

(*a*) Let U and W be two subspaces of a vector space V and Z = U + W then prove that $Z = U \oplus W$ iff for any vector $z \in Z$ can be expressed uniquely as the sum $z = u + w$, $u \in U$, $w \in W$. 8

(*b*) In a vector space V suppose $\{v_1, v_2, ..., v_n\}$ is an ordered set of vectors with $v_1 \neq 0$. The set is L.D. iff one of the vectors $v_2, v_3, ..., v_n$ say v_k belongs to the span of $v_1, v_2, ..., v_k$, i.e. $v_k \in [v_1, v_2, ..., v_{k-1}]$. 7

2. Let V be an inner product space then for arbitrary vectors u and v in V and scalars α, prove that : 15

(*i*) $\| \alpha u \| = | \alpha | \, \| u \|$

(*ii*) $\| u . v \| \leq \| u \| . \| v \|$

(*iii*) $\| u + v \| \leq \| u \| + \| v \|$.

P.T.O.

Or

(*a*) Every real vector space of dimension p is isomorphic to V_p. 8

(*b*) Let $T : U \to V$ and $S : U \to V$ be two linear transformations, then show that the mappings $M : U \to V$ defined by $M(u) = S(u) + T(u)$ and $P : U \to V$ defined by $P(u) = \alpha(S(u)) \ \forall \ u \in U$ are linear. 7

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

(*a*) If U and W be two subspaces of a vector space V, then prove that their intersection $U \cap W$ is also a subspace of V.

(*b*) Let $T : U \to V$ be a linear map, then prove that :

(*i*) $T(O_U) = O_V$

(*ii*) $T(-u) = -T(u)$.

(*c*) Let $T : P_2 \to V_3$ defined by :

$$T(\alpha_0 + \alpha_1 x + \alpha_2 x^2) = (\alpha_0, \alpha_1, \alpha_2).$$

Show that T is linear and non-singular.

(*d*) Let

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

Find the eigenvalues of A.

This question paper contains **2** printed pages]

PA—78—2024

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

MATHEMATICS

Paper XIV

(Operation Research)

(Tuesdday, 23-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. Explain the *four* basic assuptions necessary for all linear programming problem. 15

Or

(*a*) Define standard form and prove that the set of feasible solution to an L.P.P is a convex set. 8

(*b*) Use the graphical method to solve the following LPP : 7

Maximize : $Z = 2x_1 + 3x_2$

Subject to the constraints :

$x_1 + x_2 \leq 30$, $x_1 - x_2 \geq 0$, $x_2 \geq 3$, ...

$0 \leq x \leq 20$ and $0 \leq x_2 \leq 12$.

2. Explain simplex algorithm for the solution of L.P.P. and find the maximum value of $Z = 107x_1 + x_2 + 2x_3$ 15

Subject to the constraints :

$$14x_1 + x_2 - 6x_3 + 3x_4 = 7$$

$$16x_1 + x_2 - 6x_3 \leq 5$$

$$3x_1 - x_2 - x_3 \leq 0;$$

$$x_1, \quad x_2, x_3, x_4 \geq 0.$$

P.T.O.

Or

(*a*) Explain Hungarian Assignment Method. 8

(*b*) Write existence of an optimum solution and prove that the number of basic (decision) variables of the general transportation problem at any stage of feasible solution must be $m + n - 1$. 7

3. Attempt any *two* of the following :

(*a*) State the major steps for mathematical formulation of linear programming problem. 5

(*b*) Use graphical method to solve the L.P.P. 5

Maximum $Z = 2x_1 + 4x_2$

Subject to the constraints :

$x_1 + 2x_2 \leq 5$, $x_1 + x_2 \leq 4$ and

$x_1, x_2 \geq 0$

(*c*) Prove that any convex combination of k different optimum solutions to an LPP is again an optimum solution to the problem. 5

(*d*) Explain Simplex Method for solution method for Assignment problem. 5

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PA—79—2024

FACULTY OF SCIENCE AND ARTS

B.Sc./B.A. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

MATHEMATICS

Paper–XIV

(Mechanics–I)

(Tuesday, 23-4-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of non-scientific/non-programmable calculator is allowed.

1. Find the resultant when : 15

(*i*) if P = Q

(*ii*) if Q = 0

(*iii*) if Q = $\frac{\pi}{2}$

and find the resultant of two forces whose magnitudes are 8 kg and 7 kg respectively at an angle of 60°.

Or

(*a*) State and prove, Triangle law of forces. 8

P.T.O.

(*b*) Prove that if three like or unlike parallel forces be in equilibrium, the magnitude of each force varies as the distance between the other two. 7

2. Prove that, the sum of the vector moment of a system of forces acting on a particle about any point equals to the vector moment of their resultant about the same point.

And if three forces of magnitudes P, Q and R acting on a particle are in equilibrium and the angle between P and Q is double the angle between P and R, then show that : 15

$$R^2 = Q\ (Q - P)$$

Or

(*a*) Prove that, two couples, acting in one plane upon a rigid body, whose moments are equal and opposite, balance each other, when the forces constituting the couples are not parallel. 8

(*b*) Find the vector moment of a force $\vec{F} = \vec{i} + 2\vec{j} + 3\vec{K}$ acting at a point (–1, 2, 3) about the origin. 7

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

(*a*) Find the smaller force, when the two forces act at an angle of 120°, the greater force is of 30 kg and resultant is perpendicular to smaller one.

(*b*) Prove that, if three forces of magnitudes P, Q and R respectively acting on a particle are in equilibrium, each is proportional to the sine of the angle between the other two :

i.e. $\frac{P}{\sin\alpha} = \frac{Q}{\sin\beta} = \frac{R}{\sin\gamma}$,

where $\measuredangle\left(\vec{Q}, \vec{R}\right) = \alpha$

$\measuredangle\left(\vec{R}, \vec{P}\right) = \beta$

and $\measuredangle\left(\vec{P}, \vec{Q}\right) = \gamma$

(*c*) If A and B are two smooth pegs in a horizontal line at a distance 5 m apart. Two light enextensible strings CA and CB of length 3 m and 4 m respectively attached to pegs. Find the tensions in the strings, when a weight of 10 kg is suspended from C.

(*d*) Prove that, the conditions of equilibrium of forces acting on a rigid body in Cartesian form.

This question paper contains **3** printed pages]

PA—80—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

MATHEMATICS

Paper–XIV

Numerical Analysis

(Tuesday, 23-4-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of non-programmable calculator is allowed.

1. Prove that Newton-Gregory formula for forward interpolation using polynomial in x of degree n. Find the number of students who obtained less than 45 marks from the following table : 15

Marks	**No. of Students**
30 – 40	31
40 – 50	42
50 – 60	51
60 – 70	35
70 – 80	31

P.T.O.

Or

(*i*) Prove that the nth divided difference of a polynomial of the nth degree are constants. 8

(*ii*) Estimate the missing term in the following table : 7

x	y
16	39
18	85
20	–
22	151
24	264
26	388

2. Prove the Bessel's interpolation formula and find y_{35} using Stirling's formula.

Given : $y_{20} = 512$, $y_{30} = 439$,

$y_{40} = 346$, $y_{50} = 243$. 15

Or

(*i*) Prove that the general quadrature formula for equidistant ordinates. 8

(*ii*) Evaluate $\int_0^4 e^x \, dx$ by using Simpson's $\frac{3}{8}$th rule. Given $e^0 = 1$, $e^1 = 2.72$, $e^2 = 7.39$, $e^3 = 20.09$, $e^4 = 54.60$. 7

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

(*i*) Prove that :

$$e^x = \left(\frac{\Delta^2}{\mathrm{E}}\right) e^x \cdot \frac{\mathrm{E}e^x}{\Delta^2 e^x}$$

(*ii*) Prove that nth divided differences of a polynomial of the nth degree are constant.

(*iii*) Prove that : $\mu^2 = 1 + \frac{1}{4}\delta^2$.

(*iv*) Explain Euler's modified method to solve the differential equation of the first order :

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

This question paper contains **2** printed pages]

PA—21—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

BOTANY

Paper XII

(Cell and Molecular Biology)

(Friday, 12-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *all* questions.

(*ii*) Draw neat and well labelled diagrams wherever necessary.

1. Describe the ultrastructure of prokaryotic cell. 15

Or

Describe in brief :

(*a*) Structure of a typical chromosome 8

(*b*) Cell cycle. 7

P.T.O.

2 Describe in detail Watson and Crick's model of DNA. 15

Or

Describe in brief :

(*a*) Morgan's view of gene concept. 8

(*b*) PKU. 7

3. Attempt any *two* out of four : 10

(*a*) Nucleolus

(*b*) Shapes of chromosome

(*c*) tRNA

(*d*) Sickle cell anaemia.

This question paper contains **2** printed pages]

PA—32—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

BOTANY

Paper XIII

(Plant Pathology-I)

(Monday, 15-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *all* questions.

(*ii*) Illustrate your answers with suitably labelled diagrams wherever necessary.

1. Describe in detail classification of plant diseases on the basis of symptoms. 15

Or

Write on :

(*a*) Entry of plant pathogens through stomata and wounds. 8

(*b*) Dispersal of plant pathogens by insects and animals. 7

P.T.O.

2 Write in detail symptoms, causal organisms, disease cycle and control measures of grain smut of jowar. 15

Or

Write on :

(*a*) Leaf spot of turmeric. 8

(*b*) Sigatoka disease of banana. 7

3. Attempt any *two* out of four : 10

(*a*) Role of moisture in plant disease development.

(*b*) Pure culture technique

(*c*) Brown leaf spot of rice

(*d*) Symptoms of red rot of sugarcane.

This question paper contains **2** printed pages]

PA—51—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

[CBCS/New Pattern]

ZOOLOGY

Paper–XII

(Ecology and Zoo-geography)

(Thursday, 18-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions

(*ii*) Draw diagrams wherever necessary.

1. What is ecosystem ? Describe in detail the aquatic ecosystem with suitable example. 15

Or

Write notes on :

(*a*) Age distribution 8

(*b*) Parasitism 7

2. Describe in detail the sources, effects and control measures of noise pollution. 15

P.T.O.

Or

Write notes on :

(*a*) Desert adaptations 8

(*b*) Oriental realm. 7

3. Write notes on any *two* of the following : 10

(*a*) Ecological pyramid

(*b*) Population density

(*c*) Solar energy

(*d*) Necessity of wildlife conservation.

This question paper contains **2** printed pages]

PA—64—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(New/CBCS Pattern)

ZOOLOGY

Paper–XIII

(Applied Zoology Pisciculture)

(Saturday, 20-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions.

(*ii*) Illustrate your answers with suitable and labelled diagrams wherever necessary.

1. Explain in detail preparation and management of rearing pond. 15

Or

(*a*) Give an account on Striping method. 8

(*b*) Give an account on Bombay Duck fishery. 7

P.T.O.

2. Describe in detail Fish Diseases caused by Bacteria and Arthropods. 15

Or

(*a*) Explain in brief Salting and Canning as fish preservation methods. 8

(*b*) Give an account on Fish byproducts. 7

3. Write short notes on any *two* of the following : 10

(*a*) Stocking pond

(*b*) *Cirrhinus mrigala*

(*c*) Gill net

(*d*) Causes of fish spoilage.

This question paper contains **2** printed pages]

PA—65—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(New/CBCS Pattern)

ZOOLOGY

Paper–XIII

(Applied Zoology)

[Applied Parasitology–I (Parasitic Protozoa and Platyhelminthes)]

(Saturday, 20-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions.

(*ii*) Draw a well labelled diagrams, wherever necessary.

1. Describe the morphology, life cycle, pathogenicity, diagnosis treatment and prophylaxis of *Trichomonas vaginalis*. 15

Or

(*a*) Explain asexual phase of life cycle of *Plasmodium vivax.* 8

(*b*) Describe the morphology and pathogenicity of *Trypanosoma gambiense*.

P.T.O.

7

2. Give an account of the morphology, life cycle, pathogenicity and treatment of *Gastrodiscoides nominis*. 15

Or

(*a*) Describe the morphology and treatment of *Taenia saginata*. 8

(*b*) Illustrate the general organization in Cestode. 7

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

(*a*) Host specificity

(*b*) Cercaria larva

(*c*) Morphology of *Eimeria tenella*

(*d*) Plerocercoid larva.

This question paper contains **2** printed pages]

PA—66—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(New/CBCS Pattern)

ZOOLOGY

Paper–XIII–C

(Applied Zoology)

(Entomology–I)

(Saturday, 20-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions.

(*ii*) Illustrate your answers with suitably labelled diagrams, wherever necessary.

1. Describe methods of insects collection and preservation. 15

Or

(*a*) Explain external morphology of cockroach. Add a note on sexual dimorphism. 8

(*b*) Explain male reproductive system of cockroach. 7

P.T.O.

2. Describe salient features with suitable examples of order Diptera and Lepidoptera. 15

Or

(*a*) Explain types of metamorphosis. 8

(*b*) Explain effect of light and humidity on insect life. 7

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

(*a*) Killing bottle

(*b*) Gizzard

(*c*) Beetle

(*d*) Hormones that control metamosphosis.

This question paper contains **2** printed pages]

PA—67—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(New/CBCS Pattern)

ZOOLOGY

Paper–XIII

(Applied Zoology)

(Environmental Biology–I)

(Saturday, 20-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions.

(*ii*) Illustrate your answer with suitable diagram wherever necessary.

1. What is hydrosphere ? Describe the chemical and physical properties of water. 15

Or

(*a*) Energy flow in Ecosystem 8

(*b*) Food chain and food web. 7

P.T.O.

2. Explain in detail threats of Biodivesity. 15

Or

(*a*) Causes for wildlife depletion 8

(*b*) Importance of wildlife. 7

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

(*a*) Sulphur cycle

(*b*) Zonation in intertidal habitat

(*c*) In-situ conservation

(*d*) Zoological parks.

This question paper contains **2** printed pages]

PA—175—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(New/CBCS Pattern)

FISHERY SCIENCE

Paper XII

(Indian Marine Fisheries)

(Saturday, 04-05-2024) **Time : 10.00 a.m. to 12.00 noon.**

Time—Two Hours *Maximum Marks*—40

Note :— (*i*) Attempt *All* questions.

(*ii*) Illustrate your answers with suitable sketches wherever necessary.

1. Describe in detail Mackerel fishery of India. 15

Or

Write notes on :

(*a*) Chank fishery 8

(*b*) Spawning and fecundity of Hilsa. 7

P.T.O.

2. Explain in detail prawn culture. 15

Or

Write notes on :

(*a*) Pulicat lake 8

(*b*) Hooghly Matlah estuary. 7

3. Write short notes on any *two* of the following : 10

(*a*) Food and feeding habits of sole fishery

(*b*) Pomfert fishery

(*c*) Pearl oyster culture

(*d*) Kolleru lake.

This question paper contains **2** printed pages]

PA—233—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

FISHERY SCIENCE

Paper XIII

(Aquaculture Techniques and Fish Nutrition)

(Friday, 10-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Draw suitable diagrams wherever necessary.

1. Explain in detail Indian major carp culture. 15

Or

Write notes on :

(*a*) Significance of probiotics in Aquaculture. 8

(*b*) Water quality maintenance for probiotics. 7

2. Give an account on mill-by-products used in fish feed ingredients. 15

Or

Write notes on :

(*a*) General characters of penaeus indicus. 8

(*b*) Selection of site for prawn culture. 7

P.T.O.

3. Write notes on any two of the following : 10

(*a*) General characters of seabass

(*b*) Water quality for prawn culture

(*c*) Oil extractives

(*d*) Criteria for probiotics selection.

This question paper contains **2** printed pages]

PA—234—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New)

FISHERY SCIENCE

Paper XIII

(Soil and Water Quality Management in Aquaculture)

(Friday, 10-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Figures on right side indicate full marks.

(*iii*) Draw well-labelled sketches wherever necessary.

1. Explain in detail physico-chemical properties of water. 15

Or

Write notes on :

(*a*) Eutrophication of water resources. 8

(*b*) Soil quality monitoring management. 7

2. Write an account on different kinds of fertilizers and biofertilizers used. 15

P.T.O.

Or

Write notes on :

(*a*) Aquatic weed management. 8

(*b*) Water filtration devices. 7

3. Write short notes on any *two* of the following : 10

(*a*) Aquatic microorganisms and its role in carbon

(*b*) Water quality standards

(*c*) Treatment of sewage

(*d*) Water quality management in hatcheries.

This question paper contains **2** printed pages]

PA—92—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

MICROBIOLOGY

Paper XII

(Microbial Genetics)

(Monday, 29-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *All* questions.

(*ii*) Represent your answer with suitable diagrams wherever necessary.

1. Discuss in detail Griffith's transformation experiment as evidence for DNA as genetic material. 15

Or

Write notes on :

(*a*) Cairn's model of DNA replication. 8

(*b*) Enzymes of DNA replication. 7

P.T.O.

2. Define transduction. Discuss in detail generalized transduction. 15

Or

Write notes on :

(*a*) Holliday model of recombination. 8

(*b*) Site specific recombination. 7

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

(*a*) Structure of prokaryotic chromosome

(*b*) β-clamp

(*c*) Insertion sequence

(*d*) Competence.

This question paper contains **2** printed pages]

PA—115—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(New/CBCS Pattern)

MICROBIOLOGY

Paper XIII

(Microbial Metabolism)

(Thursday, 2-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

Note :— (*i*) Attempt *all* questions.

(*ii*) Draw well labelled diagrams wherever necessary.

1. Define enzyme. Explain in detail nomenclature and classification of enzymes. 15

Or

Write on the following :

(*a*) HMP pathway 8

(*b*) Role of ATP in metabolism. 7

P.T.O.

2. Define fermentation. Describe lactic acid fermentation with respect to homolactic acid fermentation. 15

Or

Write on the following :

(*a*) Chemoautotrops. 8

(*b*) Bacterial photosynthesis. 7

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

(*a*) Microbial metabolism

(*b*) Effect of pH on enzyme activity

(*c*) Role of FMN in metabolism

(*d*) Ethanol production.

This question paper contains **2** printed pages]

PA—116—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Sem.) EXAMINATION

APRIL/MAY, 2024

MICROBIOLOGY

Paper-XIII

(Nitrogen Metabolism)

(Thursday, 2-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

Note :— (*i*) Attempt *All* questions.

(*ii*) Draw well labelled diagram wherever necessary.

1. Explain structure, properties and components of nitrogenase enzyme. 15

Or

Write notes on :

(*a*) Biochemical mechanism of ammonia oxidation. 8

(*b*) Biochemical mechanism of nitrite oxidation. 7

2. Describe in detail catabolism of pyrimidine nucleotides. 15

Or

Write notes on :

(*a*) Biosynthesis of α-oxoglutarate 8

(*b*) Biosynthesis of phosphoglycerate. 7

P.T.O.

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

(*a*) Process of nodulation

(*b*) Nitrate pollution

(*c*) Catabolism of Guanine nucleotides

(*d*) Enlist and draw structure of aromatic amino acids.

This question paper contains **2** printed pages]

PA—93—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(New/CBCS Pattern)

ELECTRONICS

Paper XII

(Communication Electronics-I)

(Monday, 29-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :—All questions are compulsory.

1. Define modulation and demodulation. Draw the circuit diagrams and necessary waveforms and explain the circuit action of :

   (*i*) BJT collector modulation

   (*ii*) Linear diode detector. 15

Or

   (*a*) Describe the classification of electronic communication system based upon technique of transmission of signal. 8

   (*b*) Draw the block diagram of basic communication system and explain function of each block. 7

P.T.O.

2. Define modulation index and deviation ratio for frequency modulation : 15

(*i*) Derive an expression for FM wave.

(*ii*) The equation of an angle modulated voltage is :

$$e = 10 \sin (10^8 t + 3 \sin 10^4 t)$$

Calculate the carrier and modulating frequencies, the modulation index and deviation.

Or

(*a*) Describe the process of generation and detection of PAM. 8

(*b*) Draw the block diagram of PCM receiver and explain its working. 7

3. Write short notes on any *two* : 10

(*a*) Quantization process

(*b*) Varactor diode modulator

(*c*) Frequency spectrum of AM

(*d*) Need of modulation.

This question paper contains **2** printed pages]

PA—117—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

ELECTRONICS

Paper XIII

(Power Electronics-I)

(Thursday, 2-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

Note :— (*i*) Attempt *all* questions.

(*ii*) Illustrate your answers with suitably labelled diagram wherever necessary.

1. Discuss the two transistor model of a thyristor. Derive an expression for the anode current and discuss there from the turn-ON mechanism of a thyristor. 15

Or

(*a*) Explain the construction and V-I characteristics of DIAC. 8

(*b*) Explain the basic structure of depletion enhancement MOSFET. 7

P.T.O.

2. Why SCRs are required to be connected in parallel ? What are the problems associated with parallel connection of SCRs ? How are they eliminated ? 15

Or

(*a*) Discuss the basic requirements for successful firing of thyristor in detail. 8

(*b*) With the help of a neat circuit diagram and suitable waveforms explain resistance firing circuit. 7

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

(*a*) Thermal triggering

(*b*) SBS and SUS symbol and V-I characteristics

(*c*) Pulse transformer

(*d*) String efficiency.

This question paper contains **2** printed pages]

PA—118—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

ELECTRONICS

Paper XIII

('C' Programming)

(Thursday, 2-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

Note :—All questions are compulsory.

1. What are 'C' operators ? Give its classification and explain in detail. 15

Or

(*a*) What is looping in 'C' ? Give syntax of for loop and explain it. 8

(*b*) Using branching statement in 'C', write a program to find the given number is odd or even. 7

2. What is an array ? Give its type and explain in detail one-dimensional array. 15

P.T.O.

Or

(*a*) What is pointer variable ? Explain address of operator used in pointer. 8

(*b*) What do you mean by structure in 'C' ? Give its general form and explain. 7

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

(*a*) Data types in 'C'

(*b*) While loop

(*c*) String function

(*d*) Union.

This question paper contains **2** printed pages]

PA—314—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

COMPUTER SCIENCE

Paper–XII

(Software Engineering)

(Saturday, 04-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Assume suitable data, if necessary.

1. Define Software Engineering. Explain its key elements and discuss software engineering process. 15

Or

(*a*) What are major attributes of quality for web apps ? 8

(*b*) What are primary technical considerations when building a mobile app. 7

P.T.O.

2. What is Requirement Engineering ? Explain it in detail. 15

Or

(*a*) Explain extreme programming model. 8

(*b*) Explain prototyping model 7

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

(*a*) Software myths

(*b*) Generic process model

(*c*) Software architecture

(*d*) Mobile app design-best practices

This question paper contains **2** printed pages]

PA—321—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

COMPUTER SCIENCE

Paper—XIII

(Programming in Visual Basic)

(Friday, 10-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data, if necessary.

1. Explain loop statements with example. 15

Or

(*a*) Explain designing user interface in V.B. . 8

(*b*) Explain data types in V.B. . 7

P.T.O.

2. Explain list box and combo box with their properties. 15

Or

(*a*) Explain picture box control. 8

(*b*) Explain MDI form. 7

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

(*a*) Array in V.B.

(*b*) Option button properties

(*c*) Appearance of Form

(*d*) Event driven programming.

This question paper contains **2** printed pages]

PA—322—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

COMPUTER SCIENCE

Paper—XIII

(Advanced Java Programming)

(Friday, 10-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks

(*iii*) Assume suitable data, if necessary.

1. Explain basics of object-oriented programming. 15

Or

(*a*) Explain multiple catch statement. 8

(*b*) Explain stopping and blocking thread. 7

2. Explain applet life cycle. 15

P.T.O.

Or

(*a*) What is graphics class ? Explain drawing arcs. 8

(*b*) Explain preparing to write applet. 7

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

(*a*) Synchronization

(*b*) Syntax of Exception handling code

(*c*) Creating executable applet

(*d*) Concept of stream.

This question paper contains **2** printed pages]

PA—07—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

PHYSICS

Paper XIV

(Atomic, Molecular and Nuclear Physics)

(Saturday, 06-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

(*iii*) Symbols carry usual meaning unless and otherwise stated.

1. Explain Zeeman effect in detail and obtain expression for Zeeman shift. 15

Or

(*a*) Draw well labelled energy level diagrams that explain vibrational spectra as diatomic molecule. 8

(*b*) Explain Raman effect in detail. 7

P.T.O.

2. Describe the construction and working of a cyclotron. Discuss its limitations. 15

Or

(*a*) Explain nuclear transmutations by α-particles and protons. Give at least *four* reactions each. 8

(*b*) Describe the conservation laws in nuclear reactions. 7

3. Write short notes on any *two* : 10

(*a*) Magnetic orbital quantum number

(*b*) Rotational spectra diatomic molecule

(*c*) Need of particle accelerators

(*d*) Nuclear fission.

This question paper contains **3** printed pages]

PA—17—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(New/CBCS Pattern)

PHYSICS

Paper–XV

(Digital and Communication Electronics)

(Wednesday, 10-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) *All* questions are compulsory.

(*ii*) Figures to the right side indicate full marks.

(*iii*) Use of non-programmable calculator is allowed.

1. Draw a logic circuit diagram of full adder with its truth table. Hence draw K-map for outputs S_n and C_n. 15

P.T.O.

Or

(*a*) Convert the following numbers :

(*i*) $(101111)_2 = (\quad)_{10}$

(*ii*) $(6571)_8 = (\quad)_2$

(*iii*) $(9624)_{10} = (\quad)_{16}$

(*iv*) $(DE94)_{16} = (\quad)2$ 8

(*b*) Perform the following :

(*i*) 0111011 + 0011111

(*ii*) 10111 — 01101

(*iii*) 110001 × 111

(*iv*) 1110101 ÷ 1001. 7

2. What are the types of modulation ? Derive an expression for frequency modulated voltage. Draw the waveforms. 15

Or

(*a*) Draw the block diagram of Tuned Radio Frequency (TRF) receiver. Explain function of each block. 8

(*b*) Explain characteristics of radio receiver : selectivity, sensititivity, fidelity. 7

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

(*a*) BCD code

(*b*) AND, OR and NOT gates

(*c*) Power output in AM.

(*d*) Basic communication system.

1This question paper contains **3** printed pages]

PA—18—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CNSE/New Pattern)

PHYSICS

Paper–XV

(Fiber Optical Communication)

(Wednesday, 10-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* *All* questions are compulsory.

1. Describe the concept of acceptance angle and numerical aperture. Derive the relation between them. A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and cladding refractive index of 1.47. Determine : 15

   (*i*) The critical angle at the corecladding interface.

   (*ii*) NA of the fiber

   (*iii*) The acceptance angle in air for the fiber.

Or

P.T.O.

(*a*) What are the different types of optical fiber ? Explain the phenomenon of propagation of light through all these fibers with neat diagrams. 8

(*b*) Derive an expression for the normalized frequency in terms of numerical aperture and relative refractive index difference. 7

A multimode step index fiber with a core diameter 80 μm and relative refractive index difference of 1.5% is operating at a wavelength of 0.85 μm. If the core refractive index is 1.48, then estimate :

(*i*) Normalized frequency of fiber

(*ii*) Number of guided modes.

2. Write down the two expressions which represent index variations of graded index fiber. Draw the diagram for a multimode graded. Index fiber with possible R.I. profiles for different values of α and explain its working.

A graded index fiber has a core with parabolic R.I. profile which has a diameter of 50 μm. The numerical aperture of the fiber is 0.2. Estimate the total number of guided modes propagting through this fiber when it is operating at a wavelength of 1 μm. 15

Or

(*a*) Derive an expression for cut-off wavelength in a single mode fiber.

Determine the cut-off wavelength for a step index fiber to exhibit single mode operation when the core refractive index and radius are 1.46 and 4.5 μm resprectively with a relative index difference being 0.25%. 8

(*b*) A graded index fiber with a parabolic refractive index profile core has a refractive index at the core axis of 1.5 and a relative index difference of 1%. Estimate the maximum possible core diameter which allows single mode operation at a wavelength of 1.3 μm. 7

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

(*i*) Advantages of single mode fibers.

(*ii*) Intermodal dispersion in multimode step index fiber

(*iii*) Skew rays

(*iv*) Guided modes of step index multimode fiber.

This question paper contains **3** printed pages]

PA—01—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(New/CBCS Pattern)

CHEMISTRY

Paper XIV(A_1)

(Organic and Inorganic Chemistry)

(Tuesday, 2-4-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. Answer any *three* of the following : 3×5=15

(*a*) What are inner orbital complex ? Explain with suitable example.

(*b*) Define CFSE. Calculate CFSE of d^4 and d^8 configuration in weak ligand field octahedral complex.

(*c*) Explain the effect of size of metal ion geometry of complex on magnitude of crystal field spliting.

(*d*) What is d-d transition ? Write its selection rule.

(*e*) Discuss electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex.

P.T.O.

2. Answer any *three* of the following : 3×5=15

(*a*) Interpret IR spectrum of the following compounds :

(*i*) Ethyne

(*ii*) *t*-butyl alcohol

(*iii*) Acetophenone.

(*b*) Define spin-spin splitting. Predict the number of NMR signal of :

(*i*) Methanol

(*ii*) Ethylamine

(*iii*) Diethyl ether.

(*c*) Define copolymer. Explain anionic polymerization with mechanism.

(*d*) Explain photofries rearrangement reaction with mechanism.

(*e*) The organic compound having molecular formula $C_4H_{10}O$ shows the following spectral data :

UV : Transparent λ_{max} = 210 nm

IR : 3600 – 3200 cm^{-1}

2950 cm^{-1}

1150 cm^{-1}

PMR : (δ ppm)

δ 1.5, s, 9H

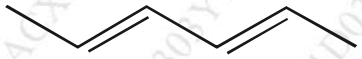
δ 4.5, s, 1H

Deduce the structure of compound.

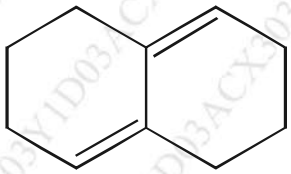
3. Answer any *two* of the following : 2×5=10

(*a*) Define bathochromic and hypsochromic effect and calculate λ_{max} of :

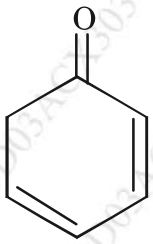
(*i*)



(*ii*)



(*iii*)



(*b*) Define chemical shift. Write the advantages of TMS.

(*c*) Give the synthesis and uses of neoprene.

(*d*) Deduce the structure of compound based on the following PMR spectral data :

Molecular formula — $C_4H_8O_2$

PMR (δ ppm) :

δ 0.9, t, 3H

δ 2.1, q, 2H

δ 3.9, s, 3H.

This question paper contains **2** printed pages]

PA—03—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

CHEMISTRY

Paper XV

(Physical and Inorganic Chemistry)

(Thursday, 04-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Use logarithmic table and non-scientific calculator is allowed.

1. Answer any *three* of the following : 3×5=15

(*a*) Discuss the structure of myoglobin and haemoglobin.

(*b*) What is nitrogen fixation ? Explain biological nitrogen fixation.

(*c*) Define borane. Give its classification.

(*d*) Define carborane. Give the synthesis of dodecaborane.

(*e*) Explain icosahedral structure of $B_{12}H_{12}^{-2}$ metalloborane.

P.T.O.

2. Answer any *three* of the following : 3×5=15

(*a*) Derive Nernst equation for single electrode potential.

(*b*) Calculate reduction potential of half-cell consisting of Mg electrode in 0.01 M Mg^{+2} ions solution at 25°C ($E^0_{red} = -2.52\,V$).

(*c*) Derive Gibbs-Helmholtz equation.

(*d*) Derive law of mass action thermodynamically.

(*e*) Describe the determination of molecular weight of a solute from relative lowering of vapour pressure.

3. Answer any *two* of the following : 2×5=10

(*a*) What are concentration cells ? Derive the equation for emf of concentration cell with transport.

(*b*) Derive equation for chemical potential of ideal gas.

(*c*) Derive Clausius–Clayperon equation.

(*d*) Define Ebullioscopic constant :

Acetone boils at 58.88 °C and a solution of 1.41 gm of organic soild in 20 g of acetone boils at 56.88 °C. If K for acetone per 1000 g is 1.67, calculate the mass of one mole of organic solid.

This question paper contains **3** printed pages]

PA—26—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBSE/New Course)

MATHEMATICS

Paper–XV

(Complex Analysis)

(Saturday, 13-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. Suppose that, $z = x + iy$ and $f(z) = u(x, y) + iv\ (x, y)$, 15

$z_0 = x_0 + iy_0$, $w_0 = u_0 + iv_0$

Then prove $\lim_{z \to z_0} f(z) = w_0$

if and only if

$\lim_{(x, y) \to (x_0, y_0)} u(x, y) = u_0$ and

$\lim_{(x, y) \to (x_0, y_0)} v(x, y) = v_0$

P.T.O.

Also show $\lim_{z \to 0} f(z)$ does not exist, for $f(z) = \frac{z}{\bar{z}}$.

Or

(*a*) Define entire function. Suppose that a function $f(z) = u(x, y) + iv(x, y)$ and its conjugate $\overline{f(z)} = u(x, y) - iv(x, y)$ are both analytic in a given domain D. Then show that $f(z)$ must be constant throughout D. 8

(*b*) (*i*) Show that :

$\log(i^3) \neq 3 \log(i)$. 7

(*ii*) If $z = -1 - \sqrt{3}\,i$, then find the value of $\log\left(-1 - \sqrt{3}i\right)$.

2. State and prove the fundamental theorem of algebra. 15

Or

(*a*) Show that, $\int_{-C} f(z)dz = -\int_{C} f(z)dz$.

Find the value of the integral $I = \int_{C} \bar{z}dz$, where C is the right hand half of the circle $|z| = 2$. 8

(*b*) Let C denote a contour of length L, and suppose that a function $f(z)$ is piecewise continuous on C. If M is a non-negative constant such that

$|f(z)| \leq M$ for all points z on C at which $f(z)$ is defined then prove that : 7

$$\left| \int_C f(z)\, dz \right| \leq ML.$$

3. Solve any *two* of the following :

(*a*) Find the cube root of 1. 5

(*b*) Solve the following :

$$\exp\left(\frac{2 + \pi i}{4}\right) = \sqrt{\frac{e}{2}}.$$ 5

(*c*) Evaluate the following integral : 5

$$\int_0^{\pi/6} e^{i2t}\, dt$$

(*d*) Let C be the positively oriented circle $|z| = 2$. Then evaluate the integral

$$\int_C \frac{z dz}{(g - z^2)(z + i)}.$$ 5

This question paper contains **3** printed pages]

PA—41—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

MATHEMATICS

Paper–XVI

(Integral Transforms)

(Tuesday, 16-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. Let $f(t)$ be a periodic function with period T, then : 15

$$L\ [f(t)] = \frac{\int_0^T e^{-st} f(t)dt}{1 - e^{-sT}}$$

and hence find the Laplace transform of the periodic function (saw tooth wave)

$$f(t) = \frac{kt}{T} \text{ for } 0 < t < T, \quad f\ (t + T) = f(t)$$

P.T.O.

Or

(*a*) Find the inverse Laplace transform of $\frac{S}{S^2 + 4S + 13}$ 8

(*b*) Find the inverse Laplace transform of 7

$$\frac{se^{-s/2} + \pi e^{-s}}{s^2 + \pi^2}$$

in terms of unit step functions.

2. (*a*) Using Laplace transforms, find the solution of the initial value problem

$$y'' - 4y' + 4y = 64 \sin 2t \qquad 8$$

$$y(0) = 0,\ y'(0) = 1.$$

(*b*) Solve $\frac{dx}{dt} + y = 0$ and $\frac{dy}{dt} - x = 0$ under the condition $x(0) = 1,\ y(0) = 0.$ 7

Or

(*a*) State and prove Fourier integral theorem. 8

(*b*) Express the function :

$$f(x) = \begin{cases} 1 & \text{when } |x| \le 1 \\ 0 & \text{when } |x| > 1 \end{cases}$$

as a Fourier integral. Hence evaluate $\int_0^\infty \frac{\sin\lambda \cos\lambda x}{\lambda}\, d\lambda$. 7

P.T.O.

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

(*a*) Find the Laplace transform of $f(t)$ defined as :

$$f(t) = \frac{t}{k} \text{ when } 0 < t < k$$

$$= 1 \text{ when } t > k$$

(*b*) Obtain the inverse Laplace transform of $\log \frac{s^2 - 1}{s^2}$.

(*c*) Applying convolution, solve the following initial value problem

$$y'' + y = \sin 3t$$

$$y(0) = 0,\ y'(0) = 0$$

(*d*) If F(s) is the complex Fourier tranform of $f(x)$, then

$$\text{F}\left\{f(x)\cos ax\right\} = \frac{1}{2}[\text{F}(s + a) + \text{F}(s - a)]$$

This question paper contains **3** printed pages]

PA—56—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

MATHEMATICS

Paper–XVII

(Topology)

(Friday, 19-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt either (A) or (B) for Q. No. **1** and **2**.

(*ii*) *All* symbols carry usual meanings.

(*iii*) Figures to the right indicate full marks.

1. (A) Attempt the following :

(*a*) Define an equivalence relation and hence prove that two equivalence classes E and E' are either disjoint or equal. 8

(*b*) Define finer and coarser topologies and hence show that if β and β' be a bases for the topologies τ and τ' respectively, on X, then the following are equivalent : 7

(*i*) τ' is finer than τ.

(*ii*) For each $x \in X$ and each basis element $B \in \beta$ containing x, there is a basis element $B' \in \beta'$ such that $x \in B' \subset B$.

P.T.O.

Or

(B) Attempt the following

(*a*) Let X be an ordered set in the order topology. Let Y be a subset of X that is convex in X. Then prove that the order topology on Y is same as the topology Y inherits as a subspace of X. 8

(*b*) Define open maps and show that $\pi_1 : X \times Y \to X$ and $\pi_2 : X \times Y \to Y$ are open maps. 7

2. (A) Let X be a topological space. Then prove that the following conditions holds :

(*i*) ϕ and X are closed. 3

(*ii*) Arbitrary intersection of closed sets are closed. 6

(*iii*) Finite union of closed sets are closed. 6

Or

(B) Attempt the following :

(*a*) Show that subspace of Hausdorff space is Hausdorff. 8

(*b*) Let $f : A \to X \times Y$ be given by the equation $f(a) = (f_1(a), f_2(a)$. Then prove that f is continuous if and only if the function $f_1 : A \to X$ and $f_2 : A \to Y$ are continuous. 7

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

(*a*) Let X be a set; let τ_f be the collection of all subsets U of X such that X–U either is finite or is all of X. Then show that τ_f is a topology on X.

(*b*) If β is a basis for the topology on X and **C** is a basis for the topology on Y, then show that the collection :

$$D = \{B \times C / B \in \beta \text{ and } C \in \mathbf{C}\}$$

is a basis for the topology on X × Y.

(*c*) Define homeomorphism. If $f : R \to R$ be a function given by $f(x) = 3x + 1$, show that it is homeomorphism.

(*d*) Prove that the union of a collection of connected subspaces of X that have a point in common is connected.

This question paper contains **2** printed pages]

PA—57—2024

FACULTY OF ARTS/SCIENCE

B.A./B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

MATHEMATICS

Paper–XVII (B)

(Mechanics-II (Dynamics)

(Friday, 19-4-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. Find the tangential and normal components of velocity. Also find the tangential and normal components of acceleration of a particle moving along the curve $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$ at $\theta = \frac{\pi}{2}$, where $\frac{d\theta}{dt}$ is constant. 15

Or

(*a*) Explain moment of momentum or angular momentum. 8

(*b*) Define work, power, kinetic energy, potential energy, mass, matter, impulsive force. 7

P.T.O.

2. Prove the necessary and sufficient condition for a force F to be conservative is that the line integral over a closed path C in a conservative field is zero, that is : 15

$$\int_C \vec{F} \cdot d\vec{r} = 0$$

Or

(*a*) Find the velocity of a particle in terms of its height at that instant. 8

(*b*) When a particle is projected at an angle α with the horizontal, the horizontal range is R and greatest height is H, prove that : 7

$$\alpha = \tan^{-1}\left(\frac{4H}{R}\right)$$

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

(*i*) Define projectile, time of flight.

(*ii*) A gun of mass M fires a shell of mass m horizontally and the energy of explosion is such as would be sufficient to project the shell vertically to a height h. Show that the velocity of recoil is $\left[\frac{2m^2gh}{M(m+M)}\right]^{1/2}$.

(*iii*) State Newton's Laws of Motion.

(*iv*) A point describes the equiangular $r = ae^{\theta}$ with constant angular speed ω about 0, 0 being the pole. Find the radial and transverse components of acceleration.

This question paper contains **3** printed pages]

PA—58—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

MATHEMATICS

Paper XVII

(Elementary Number Theory)

(Friday, 19-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Figures to the right indicate full marks.

1. State and prove Archimedian property. Also establish the result : 15

$$1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(2n+1)(n+1)}{6}$$

Or

(*a*) If p is a prime and p/ab then prove that p/a or p/b. Also if p, q_1, q_2, ..., q_n are all primes and $p/q_1q_2 \ldots q_n$, then prove that $p = q_k$ for some k, where $1 \leq k \leq n$. 8

(*b*) If P_n is the nth prime number, then prove that $P_n \leq 2^{2^{n-1}}$. 7

P.T.O.

2. If all the $n > 2$ terms of the arithmetic progression P, P + d, P + 2d, ... + P + $(n-1)\,d$ are prime numbers. Show that the common difference d is divisible by every prime $q < n$. Also prove that there are an infinite number of primes of the form $4n + 3$. 15

Or

(a) Prove that the linear congruence $ax \equiv b \pmod{n}$ has a solution if and only if d/b where $d = gcd\ (a,\ n)$. 8

(b) Let $n_1, n_2, ..., n_r$ be positive integers such that $gcd\ (n_i, n_j) = 1$ for $i \pm j$, then show that the linear congruences : 7

$x \equiv a_1 \pmod{n_1}$

$x \equiv a_2 \pmod{n_2}$

.....

$x \equiv a_r \pmod{n_r}$

has a simultaneous solution, which is unique modulo the integers $n_1 n_2 .... n_r$.

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

(a) Prove that $a^{pq} = a \pmod{pq}$ where p and q are distinct primes with $a^{\mathrm{P}} \equiv a \pmod{q}$ and $a^q \equiv a \pmod{p}$.

(*b*) Find the solutions of the system of congruences :

$7x + 3y \equiv 10 \pmod{16}$

$2x + 5y \equiv 9 \pmod{16}$

(*c*) Use the sieve of Eratosthenes to find all the primes not exceeding 100.

(*d*) If $a = qb + r$, prove that :

$gcd\ (a,\ b) = gcd\ (b,\ r)$.

This question paper contains **2** printed pages]

PA—06—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

BOTANY

Paper XIV

(Genetics and Plant Breeding)

(Saturday, 06-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) *All* questions carry equal marks.

(*iii*) Draw neat and well labelled diagram wherever necessary.

1. What is linkage ? Explain coupling and repulsion hypothesis with suitable example. Add a note on significance of linkage. 15

Or

Explain in brief :

(*a*) Chromosomal theory and sex determination in birds. 8

(*b*) Mendel's law of independent assortment. 7

P.T.O.

2. What is mass selection ? Describe procedure, merits and demerits of mass selection. 15

Or

Explain in brief :

(*a*) Mutational breeding with reference to groundnut. 8

(*b*) Plant introduction and acclimatization. 7

3. Write short notes on any *two* : 10

(*a*) CMS

(*b*) Applications of hybridization

(*c*) Klinefelter's Syndrome

(*d*) Sex determination in insects.

This question paper contains **2** printed pages]

PA—14—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(New/CBCS Pattern)

BOTANY

Paper XV

(Plant Pathology)

(Wednesday, 10-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *All* questions.

(*ii*) Draw well labelled diagrams wherever necessary.

1. Describe pre-existing structural defense mechanism in plants. 15

Or

Write notes on :

(*a*) Detection of seedborne pathogens 8

(*b*) Disease forecasting. 7

P.T.O.

2 Describe symptoms, causal organism, disease cycle and control measures of Ergot of Bajra. 15

Or

Write notes on :

(*a*) Rust of soyabean 8

(*b*) Leaf spot of cabbage. 7

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

(*a*) Hot water treatment

(*b*) Abscission layer

(*c*) Leaf curl of tomato

(*d*) Grassy shoot of sugarcane.

This question paper contains **2** printed pages]

PA—27—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

ZOOLOGY

Paper XIV

(Ethology, Biometry and Bioinformatics)

(Saturday, 13-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *All* questions.

(*ii*) Illustrate your answers with suitably labelled diagrams wherever necessary.

1. Describe acquired animal behaviour—imprinting and reasoning with examples. 15

Or

(*a*) Describe protective and aggressive colouration. 8

(*b*) Describe chemical communication. 7

P.T.O.

2 Discuss applications of bioinformatics. 15

Or

(*a*) Describe methods of collection of data. 8

(*b*) Describe mean and mode with merits. 7

3. Attempt any *two* out of four : 10

(*a*) Conditioning acquired animal behaviour

(*b*) Taxis-animal behaviour

(*c*) Histogram graphic representation data

(*d*) Internet and its uses.

This question paper contains **2** printed pages]

PA—42—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

ZOOLOGY

Paper–XV

(Applied Zoology)

(Aquaculture)

(Tuesday, 16-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions.

(*ii*) Illustrate your answers with suitably labelled diagrams wherever necessary.

1. Explain sewage fed fish culture. 15

Or

(*a*) Monoculture 8

(*b*) Fish cum duck farming. 7

P.T.O.

2. Explain pearl oyster culture 15

Or

(*a*) Larvicidal fishes in India 8

(*b*) Types of aquatic weeds and their advantages. 7

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

(*a*) Concept of Extensive Aquaculture

(*b*) Domestic sewage

(*c*) Biological control of Aquatic Weeds

(*d*) Types of Mariculture

This question paper contains **2** printed pages]

PA—43—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

ZOOLOGY

Paper–XV

(Applied Zoology)

(Applied Parasitology–II)

(Parasitic Nematodes and Arthropods)

(Tuesday, 16-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Illustrate your answer with suitable labelled diagrams wherever necessary.

1. Explain the morphology, life-cycle, pathogenicity, diagnosis and treatment of *Ancylostoma duodenale*. 15

P.T.O.

Or

(*a*) Give the morphology and pathogenicity of *Meloidogyne* (Root knot nematode). 8

(*b*) Explain the life-cycle of *Heterodera* [Cyst nematode] 7

2. Explain the morphology, life-cycle, diseases and control measures of Bed Bug. 15

Or

(*a*) Pathogenicity and control measures of *Mallophaga*. 8

(*b*) Morphology of *Siphonaptera* (Rat flea) 7

3. Attempt any *two* out of four : 10

(*a*) General Organization of Animal Nematodes

(*b*) Pathogenicity and treatment of *Tylenchlus* (Citrus nematode)

(*c*) Mouth parts of Ticks

(*d*) Malaria.

This question paper contains **2** printed pages]

PA—72—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MARCH/APRIL, 2024

(New/CBCS Pattern)

MICROBIOLOGY

Paper XIV

(Molecular Biology)

(Monday, 22-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) *All* questions are compulsory.

(*ii*) Draw a neat labelled diagram wherever necessary.

(*iii*) Answer to the point only.

1. What is translation ? Explain process of translation in bacteria. 15

Or

Write on the following :

(*a*) Effect of 5-Bromo uracil, 2-amino purine and HNO_2 on DNA. 8

(*b*) Photoreactivation. 7

P.T.O.

2 Enlist different enzymes in recombinant DNA technology along with their role in molecular cloning. 15

Or

Write notes on :

(*a*) Positive regulation in Lac operon. 8

(*b*) Attenuation in tryptophan operon. 7

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

(*a*) Structure of ribosome

(*b*) Tautomerism

(*c*) Repressor

(*d*) Liposome fusion.

This question paper contains **2** printed pages]

PA—85—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MARCH/APRIL, 2024

MICROBIOLOGY

Paper XV-A

(Industrial Microbiology))

(Wednesday, 24-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *All* questions.

(*ii*) Represent your answers with suitable figures and examples wherever necessary.

1. What is stock culture ? Describe in detail different methods used for stock culture maintenance. 15

Or

Write notes on :

(*a*) Role of microbiologist in industrial microbiology. 8

(*b*) Auxiliary equipments of fermenter. 7

P.T.O.

2 Explain in detail chromatographic techniques used for purification of fermentation product. 15

Or

Write notes on :

(*a*) Fermentative production of citric acid. 8

(*b*) Glutamic acid production. 7

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

(*a*) Fluidised bed reactor

(*b*) Inoculum development

(*c*) Precipitation

(*d*) Antibiotics.

This question paper contains **2** printed pages]

PA—86—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MARCH/APRIL, 2024

MICROBIOLOGY

Paper XV

(Pharmaceutical Microbiology)

(Wednesday, 24-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *All* questions.

(*ii*) Draw well labelled diagrams wherever necessary.

1. Describe in detail the alternative methods of bioburden assessment. 15

Or

Write notes on :

(*a*) Microbiological tests useful for pharmaceutical sector. 8

(*b*) Role of microbiologist in laboratory management. 7

P.T.O.

2 Explain in detail the mode of action of antimicrobial agents. 15

Or

Write notes on :

(*a*) The manufacture and quality control of human immunoglobulin. 8

(*b*) Recombinant DNA technique in interferon manufacture. 7

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

(*a*) Introduction and application of pharmaceutical microbiology

(*b*) Good laboratory practice and safety

(*c*) Contamination control

(*d*) Non-injectionable sterile fluids as sterile pharmaceutical products.

This question paper contains **2** printed pages]

PA—73—2024

FACULTY OF SCIENCE

B.Sc. (Sixth Semester) EXAMINATION

MARCH/APRIL, 2024

(New/CBCS Pattern)

ELECTRONICS

Paper XIV

(Communication Electronics-II)

(Monday, 22-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *All* questions.

(*ii*) Illustrate your answer with suitable labelled diagrams, wherever necessary.

1. Explain the following characteristics of radio receiver : 15

(*i*) Sensitivity

(*ii*) Selectivity

Or

(*a*) Explain basic principle of radar system. 7

(*b*) Draw block diagram of CW Doppler radar and explain function of each block. 8

P.T.O.

2 Obtain expression for numerical aperture of optical fiber. Also, explain Snell's law. 15

Or

(*a*) 4G system of mobile communication. 7

(*b*) Cellular systems. 8

3. Write short notes on any *two* : 10

(*a*) Double spotting in radio receiver

(*b*) M.T.I. Radar

(*c*) 3G system of mobile communication

(*d*) Intermodal dispersion.

This question paper contains **2** printed pages]

PA—87—2024

FACULTY OF SCIENCE

B.Sc. (Sixth Semester) EXAMINATION

MARCH/APRIL, 2024

ELECTRONICS

Paper-XV

(Power Electronics-II)

(Wednesday, 24-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *All* questions.

(*ii*) Draw neat and labelled diagrams wherever necessary.

(*iii*) Numbers to the right indicate full marks.

1. Explain working of midpoint converters (M-2 connections) with resistive load. Find out relations for average dc load current and average dc load voltage. 15

Or

(*a*) Explain working of phase control circuit for regulating temperature. 8

(*b*) Explain working of OFF AT DARK circuit in detail. 7

P.T.O.

2. How are choppers classified ? Explain principle of step down chopper with neat circuit diagram. 15

Or

(*a*) Explain working of basic series inverter. 8

(*b*) Explain modified series inverter in detail. 7

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

(*a*) Time ratio control

(*b*) Phase angle control

(*c*) Parallel inverters

(*d*) Automatic water level indicator using SCR.

This question paper contains **2** printed pages]

PA—88—2024

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MARCH/APRIL, 2024

(New Pattern)

ELECTRONICS

Paper XV

(Electronic Instrumentation)

(Wednesday, 24-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

Note :— (*i*) Attempt *All* questions.

(*ii*) Illustrate your answers with suitably labelled diagrams wherever necessary.

1. Discuss the strain gauge and derive the equation for gauge factor. 15

Or

(*a*) Solve the example : The expected value of the voltage across a resistor is 80 V. However the measurement gives a value of 79 V. Calculate : 8

(*i*) Absolute error

P.T.O.

(*ii*) % error

(*iii*) Relative error

(*iv*) % accuracy

(*b*) Enlist the dynamic characteristics of an instrument and explain briefly. 7

2 With neat diagram explain construction and working principle of capacitive transducer for the measurement of pressure. 15

Or

(*a*) Draw the circuit diagram for precision rectifier and explain it. 8

(*b*) Draw the block diagram of basic digital multimeter. 7

3. Attempt any *two* of the following (short notes) : 10

(*a*) Static errors

(*b*) Parameters for selecting the transducer

(*c*) Thermocouple

(*d*) V to I converter.

This question paper contains **2** printed pages]

PA—311—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MARCH/APRIL, 2024

(CBCS/New Pattern)

COMPUTER SCIENCE

(Paper–XIV)

(Software Testing)

(Tuesday, 30-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) Attempt *all* questions.

(*ii*) Assume suitable data, if necessary.

1. Describe the strategic approach to software testing. 15

Or

(*a*) Explain software quality concepts. 8

(*b*) Explain formal technical reviews. 7

2. What is basis path testing ? Explain with example use of flow graph to calculate cyclomatic complexity. 15

P.T.O.

Or

(*a*) Describe the testing strategies of mobile apps. 8

(*b*) Explain web app testing process. 7

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

(*a*) SQA Tasks

(*b*) Validation testing

(*c*) Testability

(*d*) Errors within web app environment.

This question paper contains **2** printed pages]

PA—317—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

COMPUTER SCIENCE

Paper–XV

(Relational Database Management System)

(Friday, 03-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) *All* questions are compulsory.

(*ii*) Assume suiable data, if necessary.

1. Explain database system applications, purpose and view of data. 15

Or

(*a*) Explain schema diagrams. 8

(*b*) Explain database users. 7

2. Explain basic structure of SQL queries and set operations. 15

Or

(*a*) Explain features of good relational design. 8

(*b*) Explain SQL data definition. 7

P.T.O.

3. Write short notes on any *two* : 10

(*a*) Aggregate functions

(*b*) Normal forms

(*c*) Primary key

(*d*) Database engine.

This question paper contains **2** printed pages]

PA—318—2024

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

COMPUTER SCIENCE

Paper–XV

(Data Mining)

(Friday, 03-05-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data, if required.

(*iv*) Use of any electronic media such as mobile phone, digital diary and electronic calculator is not permitted.

1. Attempt the following :

(*a*) What is data mining ? Explain the concept and steps of data mining in detail. 15

P.T.O.

Or

(*b*) Explain the tools for Data warehousing in detail. 7

(*c*) Describe the mining frequent patterns. 8

2. Attempt the following :

(*a*) Define Data warehousing. Explain the application of Data warehousing and Data mining. 15

Or

(*b*) Explain the kinds of association rules. 7

(*c*) Explain the classification by decision tree. 8

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

(*a*) The Apriori Algorithm

(*b*) K-Means method

(*c*) Classification and Prediction

(*d*) Mining Algorithm