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SA—64—2025

FACULTY OF SCIENCE AND TECHNOLOGY

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

APRIL/MAY, 2025

(CBCS/New Pattern)

ZOOLOGY

Paper XIII

(Applied Zoology : A-Pisciculture)

(Tuesday, 22-4-2025)

Time : 10.00 a.m. to 12.00 noon

Time—Two Hours

Maximum Marks—40

Note :— (i) Attempt all questions.

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

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

Or

- (a) Bundh breeding 8
- (b) Biology of Catla-Catla. 7

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2. Describe in detail different types of Gears used in fishing. 15

Or

(a) Explain methods of fish preservation, freezing and smoking. 8

(b) Give an account on fish by-products. 7

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

(a) Water supply

(b) Mackerel fishery

(c) Masula

(d) Causes of spoilage of fishes.

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SA—79—2025

FACULTY OF SCIENCE/ARTS

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

APRIL/MAY, 2025

(CBCS/New Pattern)

MATHEMATICS

Paper XIV

[Mechanics—I]

(Thursday, 24-4-2025)

Time : 10.00 a.m. to 12.00 noon

Time—2 Hours

Maximum Marks—40

N.B. :— (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

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

1. State and prove law of parallelogram of forces and 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. 15

Or

- (a) State and prove Lami's theorem. 8

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- (b) If two like parallel forces of magnitudes P and Q act a rigid body A and B respectively, show that if they interchanged position the point of application of the resultant is displaced through a distance $\left(\frac{P-Q}{P+Q}\right)AB$ along AB . 7

2. Prove that the sum of vector moments of two like parallel forces acting on a rigid body about any point equals to the vector moment of their resultant about the same point, and if A particle is placed at the centre O of the circle inscribed in a $\triangle ABC$. Forces $\vec{P}, \vec{Q}, \vec{R}$ acting along $\vec{OA}, \vec{OB}$ and $\vec{OC}$ respectively are in equilibrium, then prove that : 15

$$P : Q : R = \cos \frac{A}{2} : \cos \frac{B}{2} : \cos \frac{C}{2}.$$

Or

- (a) Prove that the vector moment of the resultant couple of two couples acting upon a rigid body is the sum of the vector moments of the given couples. 8

- (b) Find the vector moment of a force $\vec{F}$ of magnitude 10 units acting at a point $(1, 2, 3)$ in the direction of the vector $2\vec{i} + \vec{j} + 2\vec{k}$ about the point $(2, 3, 1)$. 7

3. Attempt any *two* of the following :

10

- (a) Show that the resultant of two forces given by $m \cdot \vec{OA}$ and $m \cdot \vec{OB}$ is represented by $(m + n) \vec{OC}$, where the point C divides AB internally in the ratio $n : m$.
- (b) Prove that if three forces acting on a particle be represented in magnitude and direction by the three sides of triangle, taken in order, then the forces are in equilibrium.
- (c) If three forces of magnitudes P, Q, R acting on a particle are in equilibrium and angle between P and Q is double the angle between P and R. Then show that $R^2 = Q(Q - P)$.
- (d) If a force $\vec{F}$ of magnitude 8 units acts at a point P(2, 3, 4) along the line :

$$\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}.$$

find the moment of force $\vec{F}$ about x-axis.



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FACULTY OF SCIENCE

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

APRIL/MAY, 2025

PHYSICS

Paper—XIII

(Solid State Physics)

(Wednesday, 16-4-2025)

Time : 10.00 a.m. to 12.00 noon

Time—2 Hours

Maximum Marks—40

N.B. :— All questions are compulsory.

1. Define symmetry operation. Explain in detail translation, rotation, reflexion and inversion symmetry operations. 15

Or

- (a) What are the types of bonding ? Discuss formation of Ionic bond. 8
(b) Explain the Laue's method to determine the crystal symmetry in solid. 7

2. Derive an expression for the specific heat of solid by using Einstein's theory and explain its variation at low and high temperature. 15

Or

- (a) Explain in detail Drude-Lorentz theory. 8
(b) Derive an expression for thermal conductivity and electrical conductivity.

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3. Write short notes on any *two* of the following (each of 5 marks) : 10

- (a) Face Center Cubic (FCC)
- (b) van der Waals bonding
- (c) Thermionic emission
- (d) Limitation of Debye model.

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FACULTY OF SCIENCE

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

MARCH/APRIL, 2025

CHEMISTRY

Paper—XIII

(Physical and Inorganic Chemistry)

(Wednesday, 9-4-2025)

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 logarithmic tables and calculator is allowed.

1. Solve any *three* of the following :

15

(i) What are organometallic compounds ? How are they classified ?

(ii) Discuss structure of organolithium and ferrocene.

(iii) Give preparation and properties of ferrocene.

(iv) How is Nickel tetracarbonyl prepared ? Discuss its structure.

(v) Define metal carbonyl and draw the structures of $\text{Fe}_2(\text{CO})_9$ and $\text{Co}_2(\text{CO})_8$.

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2. Attempt any *three* of the following :

15

(a) Write a note on association and dissociation of solute in solvent

(b) Discuss kinetics of consecutive reaction.

(c) State and explain Franck-Condon principle

(d) Discuss energy levels of rigid rotator in rotational spectra and show that the spectral lines are equally spaced.

(e) The fundamental frequency for the HCl molecule is $8.67 \times 10^{13} \text{ s}^{-1}$ and its reduced mass is $1.63 \times 10^{-27} \text{ kg}$. Calculate force constant of HCl molecule.

3. Answer any *two* of the following :

10

(i) The pure rotational spectrum of a molecule contains a series of equally spaced lines separated by 20.80 cm^{-1} . Calculate internuclear distance of molecule. ($\mu = 1.62 \times 10^{-27} \text{ kg}$).

(ii) Discuss rotational Raman spectra of a diatomic molecule.

(iii) What is third order reaction ? Give characteristics of third order reaction.

(iv) State Henry's law and discuss applications of distribution law.

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SA—22—2025

FACULTY OF SCIENCE

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

APRIL/MAY, 2025

(CBCS/New Pattern)

PHYSICS

Paper—XII

(Quantum Mechanics)

(Saturday, 12-4-2025)

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) All symbols have their usual meanings.

(iv) Given : $h = 6.63 \times 10^{-34}$ Js.

$m = 9.1 \times 10^{-31}$ kg.

1. What is Compton effect ? Give the expression for Compton shift. 15

Or

(a) Derive Schrodinger wave equation in time dependent form and show

$H\psi = E\psi$. 8

(b) What is probability current ? Explain it. 7

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2. Derive an expression for energy of particle in one-dimensional box and calculate the energy value of electron confined in a box having $2\text{\AA}$ width. 15

Or

(a) Derive an expression for orbital quantum number. 8

(b) Deduce the Schrodinger wave equation in spherical polar form for hydrogen atom. 7

3. Write notes on (any two) : 10

(a) Uncertainty principle

(b) Expectation values

(c) Particle in a box energy quantization

(d) Magnetic quantum number.

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FACULTY OF SCIENCE & TECHNOLOGY

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

APRIL/MAY, 2025

(CBCS/New Pattern)

COMPUTER SCIENCE

Paper XII

(Software Engineering)

(Monday, 5-5-2025)

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. What is Software Engineering ? Explain changing nature of software and software myths. 15

Or

(a) Explain in detail requirement engineering. 8

(b) Explain the elements of analysis model. 7

2. Explain in detail any *two* prescriptive process model. 15

Or

(a) Explain the quality factors for web app. design. 8

(b) Discuss the best practices for mobile app design. 7

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3. Write short notes on any *two* :

10

(a) Software engineering practice

(b) Process patterns

(c) The design process

(d) Web app design goals.

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FACULTY OF SCIENCE AND TECHNOLOGY

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

APRIL/MAY, 2025

(CBCS/New Pattern)

BOTANY

Paper—XIII

(Plant Pathology-I)

(Wednesday, 16-4-2025)

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 in detail mode of entry of pathogens in host plants. 15

Or

Write on :

(a) Green ear of Bajra 8

(b) Early blight of Tomato. 7

2. Describe symptoms, causal organism, disease cycle and control measures of powdery mildew of Pea. 15

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Or

Write on the following :

(a) Laboratory diagnosis 8

(b) Scope of plant pathology. 7

3. Attempt any two out of four : 10

(a) Koch's postulates

(b) Role of cell wall degrading enzymes

(c) Symptoms of angular leaf spot of cotton

(d) Brown leaf spot of rice.

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