

This question paper contains 2 printed pages|

**SA—1001—2025**

**FACULTY OF ALL**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**ENVIRONMENTAL STUDIES (Compulsory)**

**Paper-V**

**(Monday, 28-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—2 Hours*

*Maximum Marks—40*

*N.B. :— (i) Attempt all questions.*

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

*(i) सर्व प्रश्न सोडवा.*

*(ii) आवश्यक असेल तेथे आकृती काढून नावे द्या.*

1. Write in detail uses and overexploitation of forest resources. 15

वनसंपदेचे उपयोग व त्याचा अतिस्विक्त वापर यावर सविस्तर माहिती लिहा.

*Or/किंवा*

(a) Describe soil pollution. 8

मृदा प्रदूषणाची माहिती लिहा.

(b) Development of wasteland. 7

पडीक जमिनीचा विकास.

2. Describe in detail causes, effects and control measures of Air Pollution. 15

वायु प्रदूषणाची कारणे, परिणाम व त्याचे नियंत्रण यावर सविस्तर माहिती लिहा.

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WT

( 2 )

SO—1001—2025

Or/किंवा

- (a) Productive use of biodiversity. 8  
जैवविविधतेचे उत्पादक महत्त्व.
- (b) Sustainable development process. 7  
शाश्वत विकास प्रक्रिया.
3. Write short notes on any two : 10
- (a) Nuclear hazards
- (b) Soil erosion
- (c) Ozone layer depletion
- (d) Watershed management.
- कोणत्याही दोनवर थोडक्यात टिपा लिहा :
- (a) आण्विक संकटे
- (b) जमिनीची धूप
- (c) ओझोन स्तराचा क्षय
- (d) पाणलोट क्षेत्र विकास.

SO—1001—2025

2

This question paper contains 2 printed pages]

**SA—21—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCE/New Pattern)**

**BOTANY**

**Paper—XII**

**(Cell and Molecular Biology)**

**(Saturday, 12-4-2025)**

**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 labelled diagrams.

1. Describe the prophase I of meiosis. Add a note on its significance. 15

*Or*

Describe in brief :

(a) Ultrastructure and functions of Nucleus. 8

(b) Types of Lysosomes. 7

2. What are Nucleic acids ? Describe structure and functions of *m*-RNA and *r*-RNA 15

P.T.O.

WT

( 2 )

SA—21—2025

*Or*

- (a) Lac operon model. 8
- (b) Phenylketonuria. 7
3. Write short notes on (any *two*) : 10
- (a) Functions of ER
- (b) Lampbrush chromosome
- (c) Nucleotides
- (d) Mutagens

This question paper contains 2 printed pages]

**SA—32—2025**

**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

P.T.O.

WT

( 2 )

SA—32—2025

Or

Write on the following :

- |     |   |    |
|-----|---|----|
| (a) | Laboratory diagnosis                    | 8  |
| (b) | Scope of plant pathology.               | 7  |
| 3.  | Attempt any <i>two</i> 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.                |    |

This question paper contains 2 printed pages]

**SA—33—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**MARCH/APRIL, 2025**

**(CBCS/New Pattern)**

**BOTANY**

**Paper—XIII**

**(Systematic Botany-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) *All* questions carry equal marks.

(iii) Draw neat and well labelled diagrams wherever necessary.

1. Describe in detail artificial classification of plants with reference to Linnaeus. 15

*Or*

Describe in brief :

- (1) Distinguishing features and economic importance of Rubiaceae. 8
- (2) Floral characters of Convolvulaceae. 7
2. Describe in detail the Family Combretaceae. 15

P.T.O.

WT

( 2 )

SA—33—2025

Or

Describe in brief :

- |     |  |    |
|-----|--|----|
| (1) | Role of botanical gardens in plant taxonomy            | 8  |
| (2) | Molecular systematics                                  | 7  |
| 3.  | Write short notes on any <i>two</i> of the following : | 10 |
| (a) | Scope of Angiosperm taxonomy                           |    |
| (b) | Importance of Herbarium                                |    |
| (c) | Distinguishing features of Family Cucurbitaceae        |    |
| (d) | Economic importance of Family Verbenaceae.             |    |

This question paper contains 2 printed pages]

**SA—34—2025**

**FACULTY OF SCIENCE**

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

**MARCH/APRIL, 2025**

**(CBCS/New Pattern)**

**BOTANY**

**Paper—XIII**

**(Herbal Technology-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) *All* questions carry equal marks.

(iii) Draw neat and well labelled diagrams wherever necessary.

1. Explain in detail Indian systems of medicine. 15

*Or*

(a) Describe the organized crude drug. 8

(b) Explain methods of cultivation of factors affecting the cultivation of drug plants. 7

2. Explain in detail distribution, morphology, anatomical, chemical constituents and uses of Tulsi and Aghada. 15

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WT

( 2 )

SA—34—2025

Or

- (a) Explain in detail plant tissue culture as source of biomedicine. 8
- (b) Describe the secondary metabolites production. 7
3. Write short notes on (any two) : 10
- (a) Demand and supply of MAP in India
- (b) Types of trichomes
- (c) Uses of Shatavari
- (d) Drug adulteration.

SA—34—2025

2

This question paper contains 3 printed pages]

**SA—04—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**CHEMISTRY**

**Paper-XII**

**(Organic + Inorganic Chemistry)**

**(Saturday, 5-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

---

*Time—2 Hours*

*Maximum Marks—40*

*N.B. :-* (1) Attempt *all* questions.

(2) Figures to the right indicate full marks.

1. Solve any *three* of the following :

3×5=15

(a) Discuss in brief the IUPAC nomenclature of co-ordination compounds with reference to :

(i) Name of negative ligands.

(ii) Order of naming the ligands.

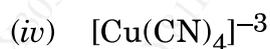
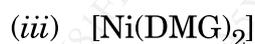
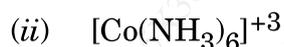
(iii) Naming of co-ordination sphere.

(iv) Name of central metal ion.

(v) Numerical prefixes to indicate number of ligands.

P.T.O.

(b) Give the IUPAC names of the following compounds :



(c) Give the classification of ligands with examples.

(d) Explain the mechanism of action of cis-platin in cancer treatment.

(e) What is Rheumatoid Arthritis (RA) disease ? Give an example of anti-arthritis drugs for treatment.

2. Solve any *three* of the following :

3×5=15

(a) Define Heterocyclic compounds. Explain molecular orbital picture of pyrrole.

(b) What are chemotherapeutic agents ? Explain Antimalarials, Antibacterials, Antifungals and Antituberculars drugs with suitable examples.

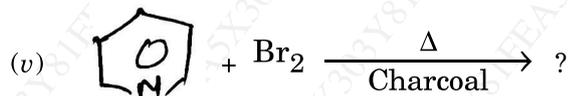
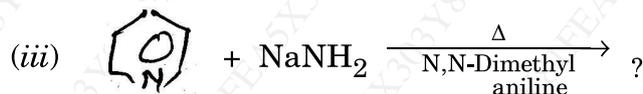
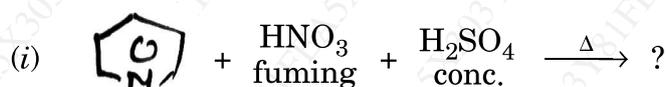
(c) Write the structural formula of Vitamin C. Mention its source and diseases caused by its deficiency.

(d) What are Herbicides and Rodenticides ? Offer the synthesis and used of DDT.

(e) Define Drug. Give the qualities of good drugs.

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

(a) Predict the products of the following reactions :



(b) Give the synthesis and uses of phenolphthalein and methyl orange.

(c) What are alkaloids ? Give the constitution of Nicotine.

(d) Give the synthesis of Thiophene from :

(i) *n*-butane

(ii) Sodium succinate.

Write the products of Halogenation and Mercuration reaction of Thiophene.

This question paper contains 2 printed pages]

**SA—10—2025**

**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  $\text{Co}_2(\text{CO})_8$ .

P.T.O.

WT

( 2 )

SA—10—2025

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  $20.80 \text{ cm}^{-1}$ . 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.

SA—10—2025

2

This question paper contains 2 printed pages]

**SA—11—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 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 table and calculator is allowed.

1. Solve any *three* of the following : 15

(i) Write a note on tetrahedral heteroatom polyanion.

(ii) Give the structure of  $O_5(CO)_4$  and  $CH_2$  fragments.

(iii) Discuss important reaction of isopolyanions and heteropolyanions.

(iv) Explain main group fragments and isolobility fragments.

(v) Explain octahedral heteroatom polyanions.

P.T.O.

WT

( 2 )

SA—11—2025

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

- (a) Explain activity of a component in ideal solution.
- (b) What are the advantages and disadvantages of DME ?
- (c) Discuss temperature dependence of vapour pressure of solution.
- (d) Account application of polarography.
- (e) What are the effects of temperature on magnetic substances ?

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

- (a) Explain measurement of magnetic susceptibility using Gouy's method.
- (b) Derive Ilkovic equation and give its significance.
- (c) Derive Gibbs Duhem Margule's equation.
- (d) Give chemical properties of ideal and non-ideal solutions..

SA—11—2025

2

This question paper contains 2 printed pages]

**SA—314—2025**

**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

P.T.O.

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( 2 )

SA—314—2025

3. Write short notes on any *two* :

10

- (a) Software engineering practice
- (b) Process patterns
- (c) The design process
- (d) Web app design goals.

SA—314—2025

2

This question paper contains 2 printed pages]

**SA—118—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS New Pattern)**

**ELECTRONICS**

**Paper XIII**

**(C Programming)**

**(Wednesday, 30-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*Note :—Attempt all questions.*

1. What are entry controlled and exit controlled looping statements in 'C' ?  
Explain in detail with their syntax. 15

*Or*

(a) Explain in detail structure of 'C' program. 8

(b) What are different data types in 'C' ? Explain in brief. 7

2. Define function. Give its syntax and explain in detail category of functions. 15

*Or*

(a) With suitable examples explain accessing variables through pointers. 8

(b) Explain in short structure initialization and accessing variables through structure. 7

P.T.O.

WT

( 2 )

SA—118—2025

3. Attempt any *two* of the following :

10

- (a) Constants and variables in 'C'
- (b) Switch statement
- (c) Recursion
- (d) Union.

SA—118—2025

2

This question paper contains 2 printed pages]

**SA—93—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**ELECTRONICS**

**Paper-XII**

**(Communication Electronics-I)**

**(Saturday, 26-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

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

1. Define amplitude modulation. Derive an expression for amplitude modulated wave. Describe the frequency spectrum of AM wave. 15

*Or*

(a) Describe in brief different types of modulation techniques used in various communication systems. 8

(b) Discuss in detail the need of modulation. 7

P.T.O.

WT

( 2 )

SA—93—2025

2. Describe the principle of direct method for FM generation and derive expression for impedance for basic reactance modulator using FET. 15

Or

- (a) Explain sampling process. 8
- (b) Discuss the operation of PCM receiver. 7
3. Write short notes on any *two* : 10
- (a) Quantization process
- (b) Varactor reactance modulator
- (c) Diode detector
- (d) Types of modulation.

This question paper contains 2 printed pages]

**SA—117—2025**

**FACULTY OF SCIENCE**

**B.Sc. (Fifth Semester) EXAMINATION**

**APRIL/MAY, 2025**

**(CBCS New Pattern)**

**ELECTRONICS**

**Paper XIII**

**(Power Electronics-I)**

**(Wednesday, 30-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

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

1. Explain principle of operation of SCR with its static anode-cathode characteristics. 15

*Or*

(a) Explain n-channel MOSFET with neat circuit diagram. 8

(b) Explain structure and V-I characteristics of DIAC and TRIAC. 7

P.T.O.

WT

( 2 )

SA—117—2025

2. Draw and explain the circuit diagram of resistor-capacitor full wave trigger circuit with waveforms. 15

*Or*

(a) Explain static equalizing network circuit. 8

(b) Explain difference in reverse recovery characteristics of SCR. 7

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

(a)  $dv/dt$  triggering

(b) Symbol and V-I characteristics of SCS and LASCR

(c) UJT as an SCR trigger

(d) String efficiency.

This question paper contains 2 printed pages]

**SA—234—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**FISHERY SCIENCE**

**Paper XIII (B-II)**

**(Soil and Water Quality Management in Aquaculture)**

**(Wednesday, 7-5-2025)**

**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) Draw labelled sketch wherever necessary.*

1. Explain role of aquatic micro-organisms in carbon, nitrogen and phosphorus cycle. 15

*Or*

Write notes on :

(a) Soil quality standards. 8

(b) Soil monitoring and management. 7

P.T.O.

WT

( 2 )

SA—234—2025

2. Write an account on waste water treatment and its management. 15

*Or*

Write notes on :

(a) Aquatic weed management. 8

(b) Water filtration devices. 7

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

(a) Physical properties of water

(b) Eutrophication of water

(c) Biofertilizers

(d) Chlorination.

SA—234—2025

2

This question paper contains 2 printed pages]

**SA—175—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**FISHERY SCIENCE**

**Paper XII**

**(Indian Marine Fisheries)**

**(Monday, 5-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

(ii) Right side figures indicate full marks.

(iii) Draw labelled sketch wherever necessary.

1. Explain in brief the account on Indian Mackerel fishery. 15

*Or*

Write notes on :

(a) Chank fishery 8

(b) General characters of *Penaeus Indicus*. 7

P.T.O.

WT

( 2 )

SA—175—2025

2. Write an account on prawn culture in India. 15

Or

Write notes on :

(a) Pulicat lake fishery. 8

(b) Kolleru lake fishery. 7

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

(a) General characters of Bombay-duck

(b) Hilsa fishery

(c) Pearl oyster culture

(d) Chilka lake fishery.

SA—175—2025

2

This question paper contains 2 printed pages]

**SA—233—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**FISHERY SCIENCE**

**Paper XIII**

**(Aquaculture Techniques and Fish Nutrition)**

**(Wednesday, 7-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

(ii) Figures to the right indicate full marks.

(iii) Draw labelled sketch wherever necessary.

1. Explain in detail crab culture. 15

*Or*

Write notes on :

(a) Food and feeding of prawn 8

(b) Methods of prawn fishing. 7

2. Describe the oil extractive fish feed ingredients. 15

P.T.O.

WT

( 2 )

SA—233—2025

Or

Write notes on :

- |     |  |    |
|-----|--|----|
| (a) | History of probiotics.                           | 8  |
| (b) | Composition of probiotics.                       | 7  |
| 3.  | Write notes on any <i>two</i> of the following : | 10 |
| (a) | Catla catla                                      |    |
| (b) | Selection of site for prawn culture              |    |
| (c) | Mill-by products                                 |    |
| (d) | Potentials of probiotics.                        |    |

SA—233—2025

2

This question paper contains 2 printed pages]

**SA—238—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS/New)**

**INDUSTRIAL CHEMISTRY**

**Paper XIII**

**(Chemical Engineering Thermodynamics)**

**(Wednesday, 7-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—2 Hours*

*Maximum Marks—40*

*N.B. :— (i) Attempt all questions.*

1. Explain third law of thermodynamics with mathematical expression. 15

*Or*

(a) Explain PVT behaviour of pure substances with mathematical expression. 8

(b) Explain energy balance of closed system. 7

2. Explain mathematical statement for second law of thermodynamics. 15

*Or*

(a) Explain Joule's experiment with mathematical expression. 8

(b) Explain phase rule for thermodynamic state. 7

P.T.O.

WT

( 2 )

SA—238—2025

3. Write short notes on any *two* :

10

- (a) Standard heat of reaction
- (b) Joule's experiment
- (c) First law of thermodynamics
- (d) Heat capacity.

SA—238—2025

2

This question paper contains 2 printed pages]

**SA—177—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**INDUSTRIAL CHEMISTRY**

**Paper—XII**

**(Unit Processes in Organic Synthesis)**

**(Monday, 5-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

---

*Time—2 Hours*

*Maximum Marks—40*

**N.B.** :— (i) All questions carry equal marks.

(ii) Use of log table and scientific calculator is allowed.

1. Explain polymerization reaction and give the synthesis of polyethylene synthesis by high pressure process. 15

*Or*

(i) Explain synthesis of Nylon 66, Nylon 6 condensation polymerization with suitable reaction mechanism. 7

(ii) Explain construction and working of Buzzi and Schmid nitrator with a suitable diagram. 8

P.T.O.

WT

( 2 )

SA—177—2025

2. Explain amination by reduction and give the construction and working of jacketed reducer with a neat labelled diagram. 15

Or

- (a) Explain bromination reaction with suitable reaction mechanism. 7
- (b) Explain methods of reduction of Nitro compounds. 8
3. Write short notes on any *two* : 10
- (a) Photochlorination
- (b) DVS calculation
- (c) Atactic polymer
- (d) Solution polymerization.

SA—177—2025

2

This question paper contains 2 printed pages]

**SA—237—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**INDUSTRIAL CHEMISTRY**

**Paper XIII**

**(Process Equipment and Design and Process Instrumentation)**

**(Wednesday, 7-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—2 Hours*

*Maximum Marks—40*

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

1. Define corrosion. Explain the types of corrosion with examples. 15

*Or*

(a) Explain the term Bimetallic thermometer and inclined micromanometer. 7

(b) Discuss the discovery of thermometer and its units with individual application. 8

P.T.O.

WT

( 2 )

SA—237—2025

2. What is distillation column ? Draw the diagram. Explain stripping and rectifying section with reflux drum. 15

Or

- (a) Discuss the propeller, turbine and anchor. 7
- (b) What are the fractionating equipment ? Explain how petrol and methane gas are separated from crude oil. 8
3. Write short notes on any *two* : 10
- (a) Fractional distillation
- (b) Simple distillation
- (c) Uniform corrosion
- (d) Helical Agitator.

SA—237—2025

2

This question paper contains 4 printed pages]

**SA—78—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**MATHEMATICS**

**Paper XIV**

**(Operation Research)**

**(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.*

1. Explain the three components of linear programming problem. Also, the manager of an oil refinery must decide on the optimum mix of two possible blending processes of which the input and output production runs are as follows :

15

**Process**

**Input**

**Output**

**Crude A**

**Crude B**

**Gasoline X**

**Gasoline Y**

1

6

4

6

9

2

5

6

5

5

P.T.O.

The maximum amounts available of crudes A and B are 250 units and 200 units respectively. Market demand shows that at least 150 units of gasoline X and 130 units of gasoline Y must be produced. The profit per production run from process 1 and process 2 are Rs. 4 and Rs. 5 respectively. Formulate the problem for maximising the profit.

*Or*

- (a) What are the major steps in the solution of a Linear programming problem by graphical method ? 7
- (b) Using graphical method, solve the L.P.P. : 8

Maximize :  $Z = 2x_1 + 4x_2$

Subject to the constraints :

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

$$x_1 + x_2 \leq 5$$

and  $x_1, x_2 \geq 0.$

2. Prove that, if an L.P.P. has a feasible solution, then it also has a basic feasible solution. 15

*Or*

- (a) A student has to select one and only one elective in each semester and the same elective should not be selected in different semesters. Due

to various reasons, the expected grades in each subject, if selected in different semester, vary and they are given below : 7

| Semester | Analysis | Statistics | Graph Theory | Algebra |
|----------|----------|------------|--------------|---------|
| I        | F        | E          | D            | C       |
| II       | E        | E          | C            | C       |
| III      | C        | D          | C            | A       |
| IV       | B        | A          | H            | H       |

The grade points are : H = 10, A = 9, B = 8, C = 7, D = 6, E = 5 and F = 4. How will the student select the elective in order to maximize the total expected points and what will be his maximum expected total points ?

- (b) A company wishes to assign 3 jobs to 3 machines in such a way that each job is assigned to some machine and no machine works on more than one job. The cost of assigning job  $i$  to machine  $j$  is given by the matrix below ( $ij$ th entry) : 8

$$\text{Cost matrix : } \begin{bmatrix} 8 & 7 & 6 \\ 5 & 7 & 8 \\ 6 & 8 & 7 \end{bmatrix}$$

Draw the associated network and also formulate the network L.P.P.

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

- (a) Prove that, a necessary and sufficient condition for the existence of a feasible solution to the general transportation problem is that :

$$\sum_{i=1}^m a_i = \sum_{j=1}^n b_j = \lambda(\text{say}).$$

P.T.O.

- (b) Explain the iterative procedure of Big-M method of L.P.P.
- (c) Rewrite in standard form the following L.P.P. :

$$\text{Minimize : } Z = 2x_1 + x_2 + 4x_3$$

Subject to the constraints :

$$-2x_1 + 4x_2 \leq 4,$$

$$x_1 + 2x_2 + x_3 \geq 5,$$

$$2x_1 + 3x_2 \leq 2,$$

$$x_1, x_2 \geq 0.$$

and  $x_3$  unrestricted in sign.

- (d) Three grades of coal A, B and C contain ash and phosphorus as impurities. In a particular industrial process a fuel obtained by blending the above grades containing not more than 25% ash and 0.03% phosphorus is required. The maximum demand of the fuel is 100 tons. Percentage impurities and costs of the various grades of coal are shown below. Assuming that there is an unlimited supply of each of coal and there is no loss in blending, formulate the blending problem to minimize the cost :

| Coal grade | % ash | % phosphorus | Cost per ton (in Rs.) |
|------------|-------|--------------|-----------------------|
| A          | 30    | 0.02         | 240                   |
| B          | 20    | 0.04         | 300                   |
| C          | 35    | 0.03         | 280                   |

This question paper contains 3 printed pages]

**SA—80—2025**

**FACULTY OF SCIENCE & TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**MATHEMATICS**

**Paper XIV**

**(Numerical Analysis)**

**(Thursday, 24-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

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*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. (A) Prove that the  $n$ th differences of a rational integral function (polynomial) of the  $n$ th degree are constant when the values of the independent variable are at equal intervals. 8

(B) A third degree polynomial passes through the points (0, -1), (1, 1), (2, 1) and (3, -2). Find the polynomial. 7

P.T.O.

WT

( 2 )

SA—80—2025

Or

Derive the Newton's formula for unequal intervals and find  $\log_{10} 656$ , from the data : 15

$$\log_{10} 654 = 2.8156, \log_{10} 658 = 2.8182,$$

$$\log_{10} 659 = 2.8189, \log_{10} 661 = 2.8202.$$

2. (A) Derive Sterling's interpolation formula for equal intervals. 8

(B) Apply Gauss's forward formula to find : 7

$$y_{30}, \text{ given that } y_{21} = 18.4708;$$

$$y_{25} = 17.8144; y_{29} = 17.1070;$$

$$y_{33} = 16.3432; y_{37} = 15.5154.$$

Or

Derive the general quadrature formula for equidistant ordinates and find first two approximations for the particular solution of : 15

$$\frac{dy}{dx} = x + z, \frac{dz}{dx} = x - y^2,$$

satisfying  $y = 2, z = 1$  when  $x = 0$ , by using Picard's method.

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

(A) Prove that,  $\left(\frac{\Delta^2}{E}\right)e^x \cdot \frac{Ee^x}{\Delta^2 e^x} = e^x$ , the interval of differencing being  $h$ .

WT

( 3 )

SA—80—2025

- (B) Find the third divided difference with arguments 2, 4, 9, 10 of the function

$$f(x) = x^3 - 2x.$$

- (C) Prove that  $\sqrt{1 + \delta^2 \mu^2} = 1 + \frac{1}{2} \delta^2$ .

- (D) Calculate by Trapezoidal's rule an approximate value of  $\int_{-3}^3 x^4 dx$  by taking seven equidistant ordinates.

SA—80—2025

3

This question paper contains 2 printed pages]

**SA—50—2025**

**FACULTY OF ARTS/SCIENCE**

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

**APRIL/MAY, 2025**

**MATHEMATICS**

**Paper XII**

**(Metric Space)**

**(Saturday, 19-4-2025)**

**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, let  $(X, d)$  be a metric space and  $Y \subseteq X$ , then a subset  $A$  of  $Y$  is open in  $(Y, d_Y)$  if and only if there exist a set  $G$  open in  $(X, d)$  such that  $A = G \cap Y$ . 15

*Or*

- (a) Prove that, every compact subset of  $A$  of a metric space  $(X, d)$  is bounded. 8

- (b) Prove that, every closed subset of a compact metric space is compact. 7

P.T.O.

2. Prove that, let  $(X, d_1)$  and  $(Y, d_1)$  be two metric spaces, then  $f : X \rightarrow Y$  is continuous if and only if  $f^{-1}(G)$  is open in  $X$ , whenever  $G$  is open in  $Y$ . 15

Or

- (a) Prove that, let  $A$  be a connected subset of a metric space  $X$  and let  $B$  be a subset of  $X$  such that  $A \subseteq B \subseteq \bar{A}$ , then  $B$  is also connected. 8
- (b) Prove that, every sequentially compact metric space  $(X, d)$  is compact. 7
3. Attempt any *two* of the following :

- (i) Prove that, let  $(X, d)$  be a metric space and  $S_r(x)$  the open sphere with centre  $x$  and radius  $r$ . Let  $A$  be a subset of  $X$  with diameter less than  $r_1$ , which intersects  $S_r(x)$ , then show that  $A \subseteq S_{2r}(x)$ . 5
- (ii) Prove that every convergent sequence is a Cauchy sequence. 5
- (iii) Let  $A$  be a non-empty compact subset of a metric space  $(X, d)$  and let  $F$  be a closed subset of  $X$  such that  $A \cap F \neq \emptyset$ , then show that  $(A, F) > 0$ . 5
- (iv) Discuss the connectedness of a subset :

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

of the Euclidean space  $\mathbb{R}^2$ . 5

This question paper contains 3 printed pages]

**SA—63—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS New Pattern)**

**MATHEMATICS**

**Paper XIII**

**(Linear Algebra)**

**(Tuesday, 22-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

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

1. Let  $U$  and  $W$  be two subspaces of a vector space  $V$  and  $Z = U + W$ , then prove that  $Z = U \oplus W$  iff the following condition is satisfied.

Any vector  $\mathbf{Z} \in Z$  can be expressed uniquely as the : 15

$$\text{sum } z = u + w, u \in U, w \in W$$

*Or*

(a) State and prove Rank-Nullity theorem. 8

(b) Prove that in an  $n$ -dimensional vector space  $V$  any set of  $n$ -linearly independent vectors is basis. 7

P.T.O.

WT

( 2 )

SA—63—2025

2. If  $S, T \in L(U, V)$  and  $\alpha, \beta$  are two scalars and : 15

$$\alpha(S + T) = \alpha S + \alpha T$$

$$(\alpha + \beta)S = \alpha S + \beta S$$

then prove that  $L(U, V)$  is vector space.

Or

(a) Define an inner product space. Also if  $V$  is an inner product space

$u, v, w \in V$  and ' $\alpha$ ' is scalar, then prove the following : 8

(a)  $(u + v) \cdot w = u \cdot w + v \cdot w$

(b)  $u(\alpha v) = \bar{\alpha}(u \cdot v)$

(c)  $0 \cdot u = 0 = u \cdot 0.$

(b) Find the Eigen values of matrix : 7

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

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

(i) If  $U$  and  $W$  are subspaces of a vector space  $V$ , then prove that :

(a)  $U \cap W$  is a subspace of  $W$

(b)  $U \cup W$  is a subspace of  $V$

Iff  $V \subset W$  or  $W \subseteq U$

(ii) Let  $T : U \rightarrow V$  be a linear map, then prove the following :

(a)  $R(T)$  is subspace of  $V$

(b)  $N(T)$  is subspace of  $U$ .

(iii) If  $ST$  is non-singular, then prove that  $T$  is one-one and  $S$  is onto.

(iv) If  $T : V_3 \rightarrow V_4$  be linear map defined by :

$$T(u_1) = v_1 - 2v_2 + v_3 - v_4$$

$$T(u_2) = v_1 - v_2 + 2v_4$$

$$T(u_3) = 2v_2 + 3v_3 - v_4$$

then find matrix of  $T$  w.r.t. standard basis.

This question paper contains 4 printed pages]

**SA—78—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**MATHEMATICS**

**Paper XIV**

**(Operation Research)**

**(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.*

1. Explain the three components of linear programming problem. Also, the manager of an oil refinery must decide on the optimum mix of two possible blending processes of which the input and output production runs are as follows :

15

**Process**

**Input**

**Output**

**Crude A**

**Crude B**

**Gasoline X**

**Gasoline Y**

1

6

4

6

9

2

5

6

5

5

P.T.O.

The maximum amounts available of crudes A and B are 250 units and 200 units respectively. Market demand shows that at least 150 units of gasoline X and 130 units of gasoline Y must be produced. The profit per production run from process 1 and process 2 are Rs. 4 and Rs. 5 respectively. Formulate the problem for maximising the profit.

*Or*

- (a) What are the major steps in the solution of a Linear programming problem by graphical method ? 7
- (b) Using graphical method, solve the L.P.P. : 8

$$\text{Maximize : } Z = 2x_1 + 4x_2$$

Subject to the constraints :

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

$$x_1 + x_2 \leq 5$$

and  $x_1, x_2 \geq 0.$

2. Prove that, if an L.P.P. has a feasible solution, then it also has a basic feasible solution. 15

*Or*

- (a) A student has to select one and only one elective in each semester and the same elective should not be selected in different semesters. Due

to various reasons, the expected grades in each subject, if selected in different semester, vary and they are given below : 7

| Semester | Analysis | Statistics | Graph Theory | Algebra |
|----------|----------|------------|--------------|---------|
| I        | F        | E          | D            | C       |
| II       | E        | E          | C            | C       |
| III      | C        | D          | C            | A       |
| IV       | B        | A          | H            | H       |

The grade points are : H = 10, A = 9, B = 8, C = 7, D = 6, E = 5 and F = 4. How will the student select the elective in order to maximize the total expected points and what will be his maximum expected total points ?

- (b) A company wishes to assign 3 jobs to 3 machines in such a way that each job is assigned to some machine and no machine works on more than one job. The cost of assigning job  $i$  to machine  $j$  is given by the matrix below ( $ij$ th entry) : 8

$$\text{Cost matrix : } \begin{bmatrix} 8 & 7 & 6 \\ 5 & 7 & 8 \\ 6 & 8 & 7 \end{bmatrix}$$

Draw the associated network and also formulate the network L.P.P.

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

- (a) Prove that, a necessary and sufficient condition for the existence of a feasible solution to the general transportation problem is that :

$$\sum_{i=1}^m a_i = \sum_{j=1}^n b_j = \lambda(\text{say}).$$

P.T.O.

- (b) Explain the iterative procedure of Big-M method of L.P.P.
- (c) Rewrite in standard form the following L.P.P. :

$$\text{Minimize : } Z = 2x_1 + x_2 + 4x_3$$

Subject to the constraints :

$$-2x_1 + 4x_2 \leq 4,$$

$$x_1 + 2x_2 + x_3 \geq 5,$$

$$2x_1 + 3x_2 \leq 2,$$

$$x_1, x_2 \geq 0.$$

and  $x_3$  unrestricted in sign.

- (d) Three grades of coal A, B and C contain ash and phosphorus as impurities. In a particular industrial process a fuel obtained by blending the above grades containing not more than 25% ash and 0.03% phosphorus is required. The maximum demand of the fuel is 100 tons. Percentage impurities and costs of the various grades of coal are shown below. Assuming that there is an unlimited supply of each of coal and there is no loss in blending, formulate the blending problem to minimize the cost :

| Coal grade | % ash | % phosphorus | Cost per ton (in Rs.) |
|------------|-------|--------------|-----------------------|
| A          | 30    | 0.02         | 240                   |
| B          | 20    | 0.04         | 300                   |
| C          | 35    | 0.03         | 280                   |

This question paper contains 2 printed pages]

**SA—116—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**MICROBIOLOGY**

Paper-XIII

(Nitrogen Metabolism)

**(Wednesday, 30-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

(ii) Draw a well labelled diagram wherever necessary.

1. Explain in detail structure and function of nitrogenase enzyme. 15

*Or*

Write notes on :

(a) Describe in detail oxidation of ammonia and hydroxylamine. 8

(b) Oxidation of nitrite. 7

2. Write a detailed note on biosynthesis of pyrimidines. 15

*Or*

(a) Biosynthesis of Histidine amino acid. 8

(b) Biosynthesis of Aromatic amino acids. 7

P.T.O.

WT

( 2 )

SA—116—2025

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

- (a) Asymbiotic nitrogen fixation
- (b) Cross inoculation process
- (c) Oxidation of Ammonia
- (d) Aromatic amino acid.

SA—116—2025

2

This question paper contains 2 printed pages]

**SA—92—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS New Pattern)**

**MICROBIOLOGY**

**Paper XII**

**(Microbial Genetics)**

**(Saturday, 26-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

(ii) Represent your answers with suitable diagram if necessary.

1. Define semiconservative replication. Explain Meselson and Stahl experiment of semiconservative mode of DNA replication. 15

*Or*

Write on :

- (a) Gierer and Schramm experiment on TMV. 8
- (b) Structure of prokaryotic chromosome. 7

P.T.O.

WT

( 2 )

SA—92—2025

2. Define transduction. Explain in detail generalized transduction in bacteria.15

Or

Write on :

- |  |    |
|--|----|
| (a) Site specific recombination.           | 8  |
| (b) Illegitimate recombination.            | 7  |
| 3. Write short notes on (any two) :        | 10 |
| (a) E. coli as a model of genetic organism |    |
| (b) Elongation of DNA replication          |    |
| (c) Branch migration                       |    |
| (d) Competence.                            |    |

This question paper contains 2 printed pages]

**SA—115—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS New Pattern)**

**MICROBIOLOGY**

**Paper XIII**

**(Microbial Metabolism)**

**(Wednesday, 30-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

(ii) *Draw labelled diagrams wherever necessary.*

(iii) *Illustrate the biochemical pathways with chemical structure of intermediate metabolites.*

1. Derive Michaelis-Menten equation. 15

*Or*

(a) Explain HMP pathway. Add a note on amphibolic nature of it. 8

(b) Illustrate in detail phosphoketolase pathways. 7

P.T.O.

WT

( 2 )

SA—115—2025

2. Elaborate in detail Butanediol fermentation. 15

*Or*

Write on :

(a) Modes of ATP generation 8

(b) Characteristics of bacterial RETC. 7

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

(i) Types of enzyme inhibition

(ii) Role of pyridine nucleotides in metabolism

(iii) Photophosphorylation

(iv) Heterolactic fermentation.

SA—115—2025

2

This question paper contains 2 printed pages]

**SA—36—2025**

**FACULTY OF SCIENCE**

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

**MARCH/APRIL, 2025**

**(CBCS/New Pattern)**

**PHYSICS**

**Paper—XIII**

**(Astrophysics)**

**(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 and carry equal marks.*

1. Explain geocentric universe and heliocentric universe. 15

*Or*

(a) Discuss solar and lunar eclipses. 8

(b) Write a short note on Nebular hypothesis. 7

2. Explain in detail the solar atmosphere, solar activity and solar limb darkening. 15

*Or*

(a) Explain apparent and absolute magnitudes. 8

(b) Write a note on photon detectors. 7

P.T.O.

WT

( 2 )

SA—36—2025

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

10

- (a) Local sidereal time and zonal time
- (b) Meteors and meteorites
- (c) Electromagnetic frequency band
- (d) Solar photosphere.

This question paper contains 2 printed pages]

**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.

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

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

P.T.O.

WT

( 2 )

SA—22—2025

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.

SA—22—2025

2

This question paper contains 2 printed pages]

**SA—35—2025**

**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.

P.T.O.

WT

( 2 )

SA—35—2025

7

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) Thermonic emission
- (d) Limitation of Debye model.

SA—35—2025

2

This question paper contains 2 printed pages]

**SA—65—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(New/CBCS Pattern)**

**ZOOLOGY**

**Paper XIII**

**(Applied Zoology)**

**(Applied Parasitology-I (Parasitic Protozoa and Platyhelminthes))**

**(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) Draw the diagrams wherever necessary.*

1. Describe the morphology, life-cycle and pathogenicity of *Entamoeba histolytica*. 15

*Or*

(a) Explain the morphology and treatment of *Balantidium coli*. 8

(b) Describe the life-cycle and treatment of *Sarcocystis cruzi*. 7

P.T.O.

WT

( 2 )

SA—65—2025

2. Give an account of the morphology, life-cycle and pathogenicity of *Schistosoma haematobium*. 15

Or

- (a) Describe the morphology and treatment of *Echinococcus granulosus*. 8
- (b) Give an account of physiological parasitic adaptation in cestodes. 7
3. Attempt any *two* out of the four : 10
- (a) Host parasite relationship
- (b) Morphology of *Eimeria tenella*
- (c) Sporocyst larva
- (d) Sparganum larva.

SA—65—2025

2

This question paper contains 2 printed pages]

**SA—66—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**ZOOLOGY**

**Paper XIII**

**(Applied Zoology Entomology-I)**

**(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 suitable labelled diagram wherever necessary.

1. Describe general characters of class insecta. 15

*Or*

(a) Describe male reproductive system of Cockroach. 8

(b) Describe female reproductive system of Cockroach. 7

2. Describe the salient features of order coleoptera with suitable example. 15

*Or*

(a) Describe hormonal control of metamorphosis in insect. 8

(b) Describe Hemimetabola and Paurometabola types of metamorphosis. 7

P.T.O.

WT

( 2 )

SA—66—2025

3. Solve any *two* of the following :

10

- (a) Forensic entomology
- (b) T.S. of Gizzard of Cockroach
- (c) Silver fish
- (d) Effect of light on insect life.

SA—66—2025

2

This question paper contains 2 printed pages]

**SA—67—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**ZOOLOGY**

**Paper XIII-D**

**(Applied Zoology : Environmental Biology–I)**

**(Tuesday, 22-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :—* (i) Attempt All questions.

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

1. Describe food chains and food web in detail. 15

*Or*

(a) Nitrogen cycle 8

(b) Structure and component of atmosphere. 7

2. Describe Biodiversity conservation. 15

P.T.O.

WT

( 2 )

SA—67—2025

*Or*

- (a) Importance of wildlife conservation. 8
- (b) Sanctuaries and zoological parks. 7
3. Write short notes on (any two) : 10
- (a) Hydrosphere
- (b) Marine habitat
- (c) Over-exploitation of resources
- (d) Causes of depletion of wildlife.

SA—67—2025

2

This question paper contains 2 printed pages]

**SA—51—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**ZOOLOGY**

**Paper XII**

**(Ecology and Zoogeography)**

**(Saturday, 19-4-2025)**

**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. What are the various components of ecosystem ? Describe the desert ecosystem. 15

*Or*

(a) Natality and mortality 8

(b) Mutualism. 7

P.T.O.

WT

( 2 )

SA—51—2025

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

Or

- |  |    |
|--|----|
| (a) Volant adaptations.                              | 8  |
| (b) Measures to protect endangered species in India. | 7  |
| 3. Write notes on any <i>two</i> of the following :  | 10 |
| (a) Atmosphere                                       | 5  |
| (b) Population equilibrium                           | 5  |
| (c) Wind energy                                      | 5  |
| (d) Australian realm.                                | 5  |

SA—51—2025

2

This question paper contains 2 printed pages]

**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

P.T.O.

WT

( 2 )

SA—64—2025

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.

SA—64—2025

2

This question paper contains 2 printed pages]

**SA—06—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS New Pattern)**

**BOTANY**

**Paper—XIV**

**(Genetics and Plant Breeding)**

**(Tuesday, 8-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—2 Hours*

*Maximum Marks—40*

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

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

1. What are duplicate genes ? Explain with suitable example. 15

*Or*

Describe in brief :

(a) Sex-linked inheritance with reference to haemophilia in man. 8

(b) Allopolyploidy with reference to hexaploid wheat. 7

P.T.O.

WT

( 2 )

SA—06—2025

2. What is mutational breeding ? Describe procedure and applications of mutational breeding. 15

Or

Explain in brief :

- (a) Mass selection 8
- (b) Objectives of plant breedings 7
3. Write short notes on (any two) : 10
- (a) Mendel's law of dominance
- (b) Klinefelter's syndrome
- (c) Applications of hybridization
- (d) Plant introduction and acclimatization

SA—06—2025

2

This question paper contains 2 printed pages]

**SA—14—2025**

**FACULTY OF SCIENCE**

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

**MARCH/APRIL, 2025**

**(CBCS/New Pattern)**

**BOTANY**

**Paper—XV**

**(Plant Pathology—II)**

**(Friday, 11-4-2025)**

**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 well labelled diagram wherever necessary.

1. Describe in detail post-infectious structural defense mechanism in plants.

15

*Or*

Write notes on :

(a) Scope and importance of aerobiology.

8

(b) Seed borne pathogens

7

P.T.O.

WT

( 2 )

SA—14—2025

2. Describe symptoms, causal organism, disease cycle and control measures of Tikka disease of Groundnut. 15

Or

Write notes on :

- (a) Leaf spot of cabbage 8
- (b) Rust of soyabean 7
3. Write short notes on (any *two*) : 10
- (a) Hot water treatment
- (b) Cuticle
- (c) Leaf curl of tomato
- (d) Papaya mosaic disease.

SA—14—2025

2

This question paper contains 2 printed pages]

**SA—15—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**BOTANY**

**Paper—XV**

**(Systematic Botany—II)**

**(Friday, 11-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

---

*Time—2 Hours*

*Maximum Marks—40*

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

(ii) Draw neat and well labelled diagram wherever necessary.

1. Describe in detail general characters of family Zingiberaceae with floral formula and floral diagram. 15

*Or*

Describe in brief :

(a) Pollen grain of Ipomoea 8

(b) Role of phytochemistry in relation to taxonomy 7

P.T.O.

WT

( 2 )

SA—15—2025

2. Describe in detail general characters of family Cyperaceae with floral formula and floral diagram. 15

*Or*

Describe in brief :

- (a) Pteridosperm theory of origin of Angiosperms 8
- (b) Bennettilalean theory of origin of Angiosperms 7
3. Write short notes on any *two* of the following : 10
- (1) Economic importance of Musaceae
- (2) Floral characters of Commelinaceae
- (3) Author citation
- (4) Time of origin of Angiosperm

SA—15—2025

2

This question paper contains 2 printed pages]

**SA—16—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**BOTANY**

**Paper—XV**

**(Herbal Technology—II)**

**(Friday, 11-4-2025)**

**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 diagrams wherever necessary.

1. Describe principle and application of GC. 15

*Or*

(a) Define SEM and add a note on its advantages. 8

(b) Magnification system of compound microscope 7

P.T.O.

WT

( 2 )

SA—16—2025

2. Explain biosynthetic pathway of alkaloids. 15

Or

(a) Write a note on capsule and medicated wine. 8

(b) Write in brief concentration in herbal formulation. 7

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

(a) Application of Autoclave

(b) Principle of paper chromatography

(c) Therapeutic uses of Aristha

(d) Chemistry of Withanoloids.

SA—16—2025

2

This question paper contains 2 printed pages]

**SA—03—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**CHEMISTRY**

**Paper—XV**

**(Physical & Inorganic Chemistry)**

**(Friday, 4-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

---

*Time—2 Hours*

*Maximum Marks—40*

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

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

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

(a) Describe the function of haemoglobin in living room.

(b) Explain biological role of alkali and alkaline earth metal ion in biological system.

(c) Describe 'three centered two electron bond' in diborane.

(d) Describe the structure of dicarboclosodecacarborane.

(e) What is Wade rule ? Calculate the total number of electrons in  $B_{12}H_{12}^{-2}$ .

P.T.O.

WT

( 2 )

SA—03—2025

2. Answer any *three* of the following :

3×5=15

- (a) What are reversible cells ? Give examples.
- (b) What is EMF of cell ? How is it measured ?
- (c) Explain variation of chemical potential with pressure.
- (d) The equilibrium constant ( $K_p$ ) of the reaction  $2\text{H}_2\text{O}(g) \rightleftharpoons 2\text{H}_2(g) + \text{O}_2(g)$  is  $13.5 \times 10^{-21}$  at 1000 K and at 1 atm pressure. Calculate the chemical affinity ( $\Delta G^\circ$ ) of the above reaction in calories.
- (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) Explain construction and working of calomel electrode.
- (b) Derive expression for variation of work function with temperature and volume.
- (c) Derive Van't Hoff's isotherm.
- (d) The normal boiling point of ethyl acetate is 77.06°C. A solution of 50 g of a non-volatile solute in 150 g of ethyl acetate boils at 84.27°C. Evaluate the molar mass of solute if  $K_b$  for ethyl acetate is 2.77°C kg mol<sup>-1</sup>.

SA—03—2025

2

This question paper contains 3 printed pages]

**SA—01—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**CHEMISTRY**

**Paper—XIV**

**(Organic & Inorganic Chemistry)**

**(Monday, 7-4-2025)**

**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.*

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

(a) Write the postulates of crystal field theory.

(b) Define CFSE and calculate CFSE in octahedral complexes having  $d^4$  and  $d^5$  configurations in weak ligand field.

P.T.O.

(c) Explain the following factors affecting the magnitude of crystal field splitting :

(i) Nature of the ligands

(ii) Oxidation state of the metal ion.

(d) Calculate the spectroscopic ground state term symbol of  $d^1$  and  $d^4$  configuration.

(e) Discuss the electronic spectrum of  $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$  complex ion.

2. Answer any *three* of the following :

3×5=15

(a) Define and explain the terms.

(i) Bathochromic and Hypsochromic shift.

(b) Explain equivalent proton with example and predict number of NMR signal of :

(i) Acetone

(ii) Methanol

(iii) Ethyl benzene.

(c) Give the synthesis and uses of :

(i) Nylon 6, 10

(ii) Neoprene.

- (d) Explain Favorskii rearrangement reaction with mechanism
- (e) The organic compound with molecular formula  $C_4H_{10}O$  shows the following spectral data :

UV : Transparent above  $\lambda_{\max} = 210$  nm

IR :  $3315\text{ cm}^{-1}$ ,  $2975$ ,  $2870\text{ cm}^{-1}$   $1150\text{ cm}^{-1}$ .

PMR :  $\delta$  1.5 s 9H

$\delta$  4.5 s 1H (exchangeable with  $D_2O$ )

Deduce the structure of compound.

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

- (a) How will you distinguish between Ethane, Ethene, Ethyne by using I.R. spectroscopy ?
- (b) Explain shielding effect with suitable example.
- (c) Describe anionic polymerization reaction with mechanism
- (d) Deduct the structure of compound based on the following PMR spectral data :

Molecular formula :  $C_7H_6O_2$

PMR :  $\delta$  7.1 – 7.5 M 5H

$\delta$  10.8 S 1H

This question paper contains 2 printed pages]

**SA—02—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**CHEMISTRY**

**Paper—XIV**

**(Organic + Inorganic Chemistry)**

**(Monday, 7-4-2025)**

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

3×5=15

(a) Define the following terms with example :

(i) Monomer

(ii) Polymer

(iii) Co-polymer

(iv) Polymerization

P.T.O.

WT

( 2 )

SA—02—2025

- (b) Give the classification of polymer on the basis of uses.
- (c) Write the comparison between organic and inorganic polymers.
- (d) Give the properties of nano particles.
- (e) Explain with example metal nanoparticles
2. Solve any *three* of the following : 3×5=15
- (a) Write the manufacture of raw cane sugar
- (b) Give a brief account on byproducts of alcohol industry.
- (c) Write the objects of singeing process.
- (d) Describe reactive and dispersed dye.
- (e) Give the synthesis and uses of Ethophan.
3. Solve any *two* of the following : 2×5=10
- (a) State any *five* principles of green chemistry.
- (b) Give the synthesis and uses of agrochemical : Monochrotophos.
- (c) What are potassic fertilizers ?

SA—02—2025

2

This question paper contains 3 printed pages]

**SA—01—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**CHEMISTRY**

**Paper—XIV**

**(Organic & Inorganic Chemistry)**

**(Monday, 7-4-2025)**

**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.*

1. Answer any *three* of the following :

3×5=15

(a) Write the postulates of crystal field theory.

(b) Define CFSE and calculate CFSE in octahedral complexes having  $d^4$  and  $d^5$  configurations in weak ligand field.

P.T.O.

- (c) Explain the following factors affecting the magnitude of crystal field splitting :
- (i) Nature of the ligands
  - (ii) Oxidation state of the metal ion.
- (d) Calculate the spectroscopic ground state term symbol of  $d^1$  and  $d^4$  configuration.
- (e) Discuss the electronic spectrum of  $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$  complex ion.

2. Answer any *three* of the following :

3×5=15

- (a) Define and explain the terms.
- (i) Bathochromic and Hypsochromic shift.
- (b) Explain equivalent proton with example and predict number of NMR signal of :
- (i) Acetone
  - (ii) Methanol
  - (iii) Ethyl benzene.
- (c) Give the synthesis and uses of :
- (i) Nylon 6, 10
  - (ii) Neoprene.

- (d) Explain Favorskii rearrangement reaction with mechanism
- (e) The organic compound with molecular formula  $C_4H_{10}O$  shows the following spectral data :

UV : Transparent above  $\lambda_{\max} = 210$  nm

IR :  $3315\text{ cm}^{-1}$ ,  $2975$ ,  $2870\text{ cm}^{-1}$   $1150\text{ cm}^{-1}$ .

PMR :  $\delta$  1.5 s 9H

$\delta$  4.5 s 1H (exchangeable with  $D_2O$ )

Deduce the structure of compound.

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

- (a) How will you distinguish between Ethane, Ethene, Ethyne by using I.R. spectroscopy ?
- (b) Explain shielding effect with suitable example.
- (c) Describe anionic polymerization reaction with mechanism
- (d) Deduct the structure of compound based on the following PMR spectral data :

Molecular formula :  $C_7H_6O_2$

PMR :  $\delta$  7.1 – 7.5 M 5H

$\delta$  10.8 S 1H

This question paper contains 2 printed pages]

**SA—318—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**COMPUTER SCIENCE**

**Paper XV**

**(Data Mining)**

**(Friday, 2-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—2 Hours*

*Maximum Marks—40*

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

(ii) Assume your own data.

(iii) Figures to the right indicate full marks.

1. Explain different applications of data warehousing and data mining. 15

*Or*

(a) Explain different steps of Data mining. 8

(b) Discuss various data mining algorithms. 7

2. Explain classification and predications in detail. 15

*Or*

(a) What is cluster analysis ? 8

(b) Explain *k*-means hierarchical method with example. 7

P.T.O.

WT

( 2 )

SA—318—2025

3. Write short notes on any *two* :

10

- (a) Tools for data warehousing
- (b) Apriori algorithm
- (c) Clustering
- (d) Performance consideration.

SA—318—2025

2

This question paper contains 2 printed pages]

**SA—317—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**COMPUTER SCIENCE**

**Paper XV**

**(Relational Database Management System)**

**(Friday, 2-5-2025)**

**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.*

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

1. What is Database ? Explain database applications. 15

*Or*

(a) Describe in detail database schema. 8

(b) Explain relational query language. 7

2. Explain features of good relational design. 15

*Or*

(a) Explain basic structure of SQL Queries. 8

(b) Discuss views in detail. 7

P.T.O.

WT

( 2 )

SA—317—2025

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

10

- (a) Database users
- (b) Keys
- (c) Normal forms
- (d) Data definition language.

SA—317—2025

2

This question paper contains 2 printed pages]

**SA—311—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**COMPUTER SCIENCE**

Paper XIV

(Software Testing)

**(Tuesday, 29-4-2025)**

**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. (A) Distinguish between White Box and Black Box testing and explain in detail Basis path testing. 15

*Or*

(B) What is software quality ? Explain Mc-Call's Quality Factors. 8

(C) Describe the elements of quality assurance of software. 7

P.T.O.

WT

( 2 )

SA—311—2025

2. (A) Explain validation testing and system testing in detail. 15

*Or*

(B) Describe the dimensions of quality for web apps. 8

(C) Explain the testing strategy for web app. 7

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

(A) Formal technical review

(B) Unit testing

(C) Testability

(D) Testing guidelines for mobile apps.

SA—311—2025

2

This question paper contains 2 printed pages]

**SA—88—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(CBCS New Pattern)**

**ELECTRONICS**

**Paper XV**

**(Electronic Instrumentation)**

**(Friday, 25-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

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

1. What do you mean by resistive type transducer ? State its type and explain working principle and operation of potentiometer. 15

*Or*

(a) Solve the example. The expected value of the current through a resistor is 20 mA. But the measurement yields a current value 18 mA. Calculate :

(i) Absolute error 8

P.T.O.

- (ii) % of error
- (iii) Relative accuracy and
- (iv) % accuracy.
- (b) State and explain static characteristics of an instrument. 7
2. State various photoelectric transducers and discuss construction and working principle of photodiode and phototransistor. 15
- Or*
- (a) With neat circuit diagram explain precision rectifier. 8
- (b) Draw block diagram of digital tachometer and explain in brief. 7
3. Attempt any *two* of the following : 10
- (a) Write a short note on standards.
- (b) Discuss in brief strain guage.
- (c) Explain in short capacitive transducer.
- (d) With neat circuit diagram explain I to V converter.

This question paper contains 2 printed pages]

**SA—73—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**ELECTRONICS**

**Paper XIV**

**(Communication Electronics-II)**

**(Wednesday, 23-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

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

1. Explain the working principle of TRF and superheterodyne radio receiver with a block diagram. 15

*Or*

(a) Explain CW Doppler radar system. 8

(b) What is microwave ? Explain properties of microwave. 7

P.T.O.

WT

( 2 )

SA—73—2025

2. Obtain an expression for Numerical Aperture (NA) of optical fibre. Also explain total internal reflection. 15

*Or*

- (a) 3G system of mobile communication. 8
- (b) Explain cellular system. 7
3. Write short notes on any *two* : 10
- (a) Sensitivity and selectivity of radio receiver
- (b) Basic principles of radar system
- (c) Fourth Generation (4G) system of mobile communication
- (d) Refraction and Snell's law.

SA—73—2025

2

This question paper contains 2 printed pages]

**SA—87—2025**

**FACULTY OF SCIENCE**

**B.Sc. (Sixth Semester) EXAMINATION**

**APRIL/MAY, 2025**

**ELECTRONICS**

**Paper XV**

**(Power Electronics-II)**

**(Friday, 25-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

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*Time—Two Hours*

*Maximum Marks—40*

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

(ii) Draw neat and well labelled diagram wherever necessary.

(iii) Numbers to the right indicate full marks.

1. Explain the single-phase fully controlled bridge rectifier with inductive load. 15

*Or*

(a) With neat circuit diagram, explain light activated turn off circuit.8

(b) With the help of neat circuit diagram, explain illumination control using DIAC and TRIAC. 7

P.T.O.

2. With the help of neat circuit diagram, explain the working of step up chopper. A step-up chopper is used to deliver load voltage of 500 V from 220 V dc source. If the blocking period of the thyristor is 8  $\mu$ s, compute the required pulse width. 15

Or

- (a) Explain parallel inverter. 8
- (b) Explain the working of basic series inverter. 7
3. Attempt any *two* of the following : 10
- (a) Phase angle control
- (b) Automatic water level indicator
- (c) Time Ratio Control (TRC) in choppers
- (d) Classification of inverters.

This question paper contains 2 printed pages]

**SA—143—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**FISHERY SCIENCE**

**Paper XV**

**(Nutrition and Feed Technology)**

**(Friday, 2-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

(ii) *Marks of each question are written on right hand side of the respective question.*

(iii) *Wherever necessary, illustrate answers with suitable and well labelled diagrams.*

1. Explain structure, classification and properties of carbohydrates. 15

*Or*

Write notes on :

(a) Physiology of digestion in shrimps. 8

(b) Factors affecting digestibility. 7

P.T.O.

WT

( 2 )

SA—143—2025

2. Explain the process of feed formulation in detail. 15

*Or*

Write notes on :

(a) Importance of natural food for nutrition of fishes. 8

(b) Probiotics. 7

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

(a) Feeding methods

(b) Accretion

(c) Growth stimulants

(d) Fatty acids.

SA—143—2025

2

This question paper contains 2 printed pages]

**SA—103—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**FISHERY SCIENCE**

**Paper XVI**

**(Ornamental Fish Production and Management)**

**(Tuesday, 29-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

(ii) Marks of each question are written on right hand side of the respective questions.

(iii) Wherever necessary, illustrate answers with suitable and well labelled diagrams.

1. Describe different accessories used in aquarium in detail. 15

*Or*

Write notes on :

(a) General characters, food and feeding habits of gold fish. 8

(b) Benefits of ornamental fish keeping hobby. 7

P.T.O.

WT

( 2 )

SA—103—2025

2. What is Gill rot ? Describe its causative agent, symptoms, treatment and control measures. 15

*Or*

Write notes on :

- (a) Breeding and reproduction in Mollies. 8
- (b) Breeding and reproduction in Siamese fighting fish. 7
3. Write short notes on any *two* of the following : 10
- (a) Symptoms of fin rot disease
- (b) Argulus
- (c) Sexual dimorphism in guppy
- (d) Ornamental fish industry.

SA—103—2025

2

This question paper contains 2 printed pages]

**SA—142—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**FISHERY SCIENCE**

**Paper XV**

**(Fisheries Economics Co-operative and Marketing Management)**

**(Friday, 2-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

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

(ii) *Marks of each question are written on right hand side of the respective question.*

(iii) *Illustrate answers with suitable and well labelled diagrams, wherever necessary.*

1. Describe marketing functions in detail.

15

*Or*

Write notes on :

(a) Demand

8

(b) Utility.

7

P.T.O.

WT

( 2 )

SA—142—2025

2. Explain in detail the organs of fisherman co-operative society. 15

*Or*

Write notes on :

(a) Exclusive Economic Zone (EEZ) 8

(b) Role of remote sensing in fisheries. 7

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

(a) Cost

(b) Primary co-operatives

(c) CIFE

(d) Price structure in fish marketing.

SA—142—2025

2

This question paper contains 2 printed pages]

**SA—147—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**INDUSTRIAL CHEMISTRY**

**Paper XV**

(Plant Design and Economics for Chemical Engineers Chemistry)

**(Tuesday, 6-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*Note :—Solve all questions.*

1. Explain plant location and plant layout for industry. 15

*Or*

(a) Describe on maintaining accounting record. 8

(b) Write a note on cash flow for industrial operation. 7

2. Explain balance sheet for an industry. 15

*Or*

(a) What are the factors affecting investment and production cost ? 8

(b) Describe cost factors in capital investment. 7

P.T.O.

WT

( 2 )

SA—147—2025

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

- (a) Estimation of total product cost
- (b) Types of interest
- (c) Present worth and discount
- (d) Income tax effects on industry.

SA—147—2025

2

This question paper contains 2 printed pages]

**SA—105—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**INDUSTRIAL CHEMISTRY**

**Paper XIV**

**(Unit Process in Inorganic Synthesis Drug Dyes and Industrial Safety)**

**(Thursday, 8-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*Note :—Use of log table and scientific calculator is allowed.*

1. Explain in detail manufacturing process of Ammonia. 15  

*Or*

  - (a) Define Antibiotic. Explain penicillin A with synthesis. 8
  - (b) Explain synthesis of aspirin with mechanism. 7
2. Explain in detail with neat labelled diagram portable fire extinguisher and selection of personal protective equipments. 15  

*Or*

  - (a) Explain methyl orange dye and auramine dye with synthesis. 8
  - (b) Explain synthesis of congo red dye and its applications. 7

P.T.O.

WT

( 2 )

SA—105—2025

3. Write short notes on any *two* :

10

- (a) Manufacturing process of urea
- (b) Polyvinyl chloride
- (c) Colour and constitution of dye
- (d) Disease classification.

SA—105—2025

2

This question paper contains 2 printed pages]

**SA—146—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**INDUSTRIAL CHEMISTRY**

**Paper XV**

**(Spectroscopy, Chromatography and Plant Utilities)**

**(Tuesday, 6-5-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*Note :—* (i) Use of log table and scientific calculator is allowed.

(ii) Attempt *all* questions.

1. Explain construction and working of infrared spectrometer with neat labelled diagram. 15

*Or*

- (a) Explain Woodward-Fieser rule for the ultraviolet spectroscopy. 8
- (b) Explain theory of electronic transition with respect to infrared spectroscopy. 7

P.T.O.

2. Explain construction and working of steam heater and boiler with neat labelled diagram. 15

*Or*

- (a) Explain Hooke's law of infrared spectroscopy. 8
- (b) Explain Franck-Condon principle of infrared spectroscopy. 7
3. Write short notes on any *two* : 10
- (a) Lambert's law of UV-spectroscopy
- (b) McLafferty rearrangement
- (c) Beer's law of UV-spectroscopy
- (d) Permanent hardness of water.

This question paper contains 3 printed pages]

**SA—57—2025**

**FACULTY OF SCIENCE & TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS/New Pattern)**

**MATHEMATICS**

**Paper XVII**

**(Mechanics-II)**

**(Monday-, 21-4-2025)**

**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.*

1. To find the radial and transverse components of velocity. 15

*Or*

(a) 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 : 8

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

P.T.O.

- (b) Show that the velocity of a particle increases from  $\vec{V}_1$  to  $\vec{V}_2$ , then the gain in the K.E is half the scalar product of impulse and the sum of  $V_1$  and  $V_2$ . 7

2. Define kinetic energy and prove that the kinetic energy of particle of mass  $m$  moving with velocity  $\vec{V}$  is  $\frac{1}{2} mV^2$ . 15

Or

- (a) To find the velocity of a particle in terms of its height at that instant. 8
- (b) A projectile aimed at mark, which is in a horizontal plane through the point of projection, falls 'a, feet short of it when the elevation is  $\alpha$  and goes' b, feet too far when the elevation is  $\beta$ . Show that if the velocity of projection be the same in both cases, the proper elevation is :

$$\frac{1}{2} \sin^{-1} \left[ \frac{a \sin 2\beta + b \sin 2\alpha}{a + b} \right]. \quad 7$$

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

- (i) Prove that if the tangential and normal acceleration a particle describing a plane curve be constant throughout the motion, the angle  $\psi$  through which the direction of motion turns in time  $t$  is given by  $\psi = A \log(1 + Bt)$ .
- (ii) State Newton's laws of motion.

- (iii) A particle of mass  $m$ , moving with velocity  $\vec{v}$  picks up a mass  $M$  at rest. Find velocity of the combined mass, the kinetic energy of the combined mass and loss in K.E.
- (iv) The angular elevation of an enemy's position on hill 25 metres high is  $45^\circ$ . Show that in order to shell it the initial velocity of projection must not be less than  $5\sqrt{g(1+\sqrt{2})}$  metres/sec.

This question paper contains 2 printed pages]

**SA—58—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(New/CBCS Pattern)**

**MATHEMATICS**

**Paper XVII**

**(Elementary Number Theory)**

**(Monday-, 21-4-2025)**

**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.

1. (a) Let S be a set of positive integers with the following properties : 15

(i) The integer 1 belongs to S

(ii) Whenever the integer  $k$  is in S, the next integer  $k + 1$  must also be in S. Prove that S is the set of all positive integers.

(b) Prove that for given integers  $a$  and  $b$ , not both of which are zero, there exist integers  $x$  and  $y$  such that  $\gcd(a, b) = ax + by$ .

*Or*

(i) If  $p$  is a prime and  $p | a_1 a_2 \dots \dots \dots a_n$  then prove that  $p | a_k$  for some  $k, 1 \leq k \leq n$ . 8

(ii) Show that there are infinite number of primes. 7

P.T.O.

2. Prove that :

15

(i) Let  $n_1, n_2, \dots, n_r$  be positive integers such that  $\gcd(n_i, n_j) = 1$

For  $i \neq j$ , then the system of linear  $x \equiv a_1 \pmod{n_1}, x \equiv a_2 \pmod{n_2}$   
 $\dots \dots \dots x \equiv a_r \pmod{n_r}$  has a simultaneous solution, which is unique  
 modulo the integer  $n_1 \cdot n_2 \cdot \dots \cdot n_r$ .

(ii) If  $p$  is a prime then  $(p-1)! \equiv -1 \pmod{p}$ .

Or

(a) Prove that :

8

(i) If  $a \equiv b \pmod{n}$  and  $c \equiv d \pmod{n}$  then  $a + c \equiv b + d \pmod{n}$

(ii) If  $a \equiv b \pmod{n}$  then  $a^k \equiv b^k \pmod{n}$  for any positive integer  $k$ .

(b) Show that there are an infinite number of primes of the form  $4n + 3$ .

7

3. Attempt any *two* of the following :

10

(a) If  $a = qb + r$  prove that  $\gcd(a, b) = \gcd(b, r)$ .

(b) Find the values of  $x$  and  $y$  which satisfy the equation  $56x + 72y = 40$ .

(c) Let  $p(x) = \sum_{k=0}^m c_k \cdot x^k$  be a polynomial function of  $x$  with integral  
 coefficient  $c_k$ , show that if  $a \equiv b \pmod{n}$ , then  $p(a) \equiv p(b) \pmod{n}$ .

(d) Show that  $2^{340} \equiv 1 \pmod{341}$ .

This question paper contains 3 printed pages]

**SA—26—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**MATHEMATICS**

(Complex Analysis-XV)

**(Tuesday, 15-4-2025)**

**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.*

1. Explain the method to obtain  $n$ th root of complex number  $z = re^{i\theta}$ . Hence find square root of  $2i$ . 15

*Or*

- (a) Show that  $u(x, y)$  is harmonic in some domain and find harmonic conjugate  $v(x, y)$  when  $u(x, y) = 2x(1 - y)$ . 8

P.T.O.

(b) Prove that if a function  $f(z) = u(x, y) + iv(x, y)$  is analytic in a domain  $D$ , then its component functions  $u$  and  $v$  are harmonic in  $D$ . 7

2. Prove that any polynomial  $P(z) = a_0 + a_1 z + a_2 z^2 + \dots + a_n z^n$  where  $a_n \neq 0$  of degree  $n(n \geq 1)$  has at least one zero. 15

Or

(a) Let  $w(t)$  be a continuous complex-valued function of  $t$  defined on an interval  $a \leq t \leq b$ . Then show that it is not necessarily true that there is a number  $C$  in the interval  $a < t < b$  such that : 8

$$\int_a^b w(t) dt = w(c)(b - a)$$

(b) Let  $w(t)$  be a piece-wise continuous complex-valued function defined on an interval  $a \leq t \leq b$ , then prove that : 7

$$\left| \int_a^b w(t) dt \right| \leq \int_a^b |w(t)| dt$$

3. Attempt any *two* of the following :

(a) Show that when a limit of a function  $f(z)$  exists at a point  $z_0$ , then it is unique. 5

(b) If  $f'(z) = 0$  everywhere in a domain  $D$ , then prove that  $f(z)$  must be constant throughout  $D$ . 5

WT

( 3 )

SA—26—2025

- (c) Let  $C$  be the arc of the circle  $|z| = 2$  from  $z = 2$  to  $z = 2i$  that lies in the first quadrant. Then show that : 5

$$\left| \int_C \frac{z+4}{z^3-1} dz \right| \leq \frac{6\pi}{7}$$

- (d) Let  $C$  be the positively oriented unit circle  $|z| = 1$ , then evaluate : 5

$$\int_C \frac{e^{2z}}{z^2} dz$$

SA—26—2025

3

This question paper contains 2 printed pages]

**SA—41—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**MATHEMATICS**

**Paper—XVI**

**(Integral Transforms)**

**(Thursday, 17-4-2025)**

**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.

1. If  $L[f(t)] = F(s)$ , then prove that :

$$L\left[\frac{1}{t}f(t)\right] = \int_s^{\infty} F(s)ds.$$

Hence find the Laplace transform of  $\frac{\sin 2t}{t}$ . 15

*Or*

(a) Using convolution theorem, find : 8

$$L^{-1}\left\{\frac{s^2}{(s^2 + a^2)(s^2 + b^2)}\right\} a \neq b.$$

P.T.O.

(b) Obtain  $L^{-1}\left(\frac{1}{s(s^2 + a^2)}\right)$ . 7

2. Solve the initial value problem :

$$2y'' + 5y' + 2y = e^{-2t}, y(0) = 1, y'(0) = 1. \quad 15$$

Or

Derive the Fourier sine and cosine integrals :

(a)  $f(x) = \frac{2}{\pi} \int_0^{\infty} \sin ux \, du \int_0^{\infty} f(t) \sin ut \, dt$  8

(b)  $f(x) = \frac{2}{\pi} \int_0^{\infty} \sin ux \, du \int_0^{\infty} f(t) \cos ut \, dt$  7

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

(a) Prove that :

$$L[f'(t)] = sL[f(t)] - f(0)$$

where  $L[f(t)] = F(s)$ .

(b) Find the inverse Laplace transform of

$$\frac{s}{s^2 + 4s + 13}$$

(c) Applying convolution solve the following initial value problem

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

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

(d) Find the Fourier sine transform of  $\frac{1}{x}$ .

This question paper contains 3 printed pages]

**SA—56—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**MATHEMATICS**

**Paper XVII**

**(Topology)**

**(Monday, 21-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

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*Time—2 Hours*

*Maximum Marks—40*

*N.B. :-* (1) Attempt either (A) or (B) for Question Nos. 1 and 2.

(2) All symbols carry usual meanings.

(3) Figures to the right indicate full marks.

1. (A) Define Topology, discrete topology, indiscrete topology and finite complement topology. Hence if  $X$  be a set. Let  $\lambda_f$  be the collection of all subsets  $U$  of  $X$  such that  $X-U$  either is finite or is all of  $X$ . Then show that  $\lambda_f$  is a topology on  $X$ . 15

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 the same as the topology  $Y$  inherits as a subspace of  $X$ . 8

(b) If  $\beta$  is a basis for the topology of  $X$  and  $\mathcal{C}$  is a basis for the topology of  $Y$ , then the collection :

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

is a basis for the topology of  $X \times Y$ . 7

2. (A) Let  $X$  and  $Y$  be topological spaces, let  $f : X \rightarrow Y$ , then the following are equivalent : 15

- (1)  $f$  is continuous
- (2) For every subset  $A$  of  $X$ , one has  $f(\overline{A}) \subset \overline{f(A)}$ .
- (3) For every closed set  $B$  of  $Y$ , the set  $f^{-1}(B)$  is closed in  $X$ .
- (4) For each  $x \in X$  and each neighbourhood  $V$  of  $f(x)$ , there is a neighbourhood  $U$  of  $x$  such that  $f(U) \subset V$ .

Or

(B) Attempt the following :

(a) Let  $A$  be a subset of the topological space  $X$ ; Let  $A'$  be a set of all limit points of  $A$ . Then show that : 8

$$\overline{A} = A \cup A'.$$

- (b) Prove that a finite Cartesian product of connected space is connected. 7

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

- (a) Let  $\beta$  and  $\beta'$  be basis for the topologies  $\lambda$  and  $\lambda'$ , respectively on  $X$ . Then show that the following are equivalent :

- (i)  $\lambda'$  is finer than  $\lambda$ .  
(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  $x \in B' \subset B$ .

- (b) If  $\beta$  is a basis for the topology of  $X$ , then show that the collection :

$$\beta_Y = \{B \cap Y / B \in \beta\}$$

is a basis for the subspace topology on  $Y$ .

- (c) Show that product of two Hausdorff space is Hausdorff.  
(d) Show that the union of a collection of connected subspace of  $X$  that have a point in common is connected.

This question paper contains 2 printed pages]

**SA—72—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**(New/CBCS Pattern)**

**MICROBIOLOGY**

**Paper XIV**

**(Molecular Biology)**

**(Wednesday, 23-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

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*Time—Two Hours*

*Maximum Marks—40*

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

(ii) Represent your answers with suitable diagrams if necessary.

(iii) Answer to the point.

1. Define translation. Discuss in detail process of translation in bacteria. 15

*Or*

Write on :

(a) Nitrous oxide as mutagenic agent. 8

(b) Mechanism of spontaneous mutation. 7

P.T.O.

WT

( 2 )

SA—72—2025

2. What is operon ? Explain in detail regulation in Tryptophan operon. 15

*Or*

Write on :

- (a) Bacteriophage as vector. 8
- (b) Insertional inactivation. 7
3. Write short notes on (any two) : 10
- (a) Wobble hypothesis
- (b) Photoreactivation
- (c) Inducer
- (d) Colony hybridization.

SA—72—2025

2

This question paper contains 2 printed pages]

**SA—85—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**APRIL/MAY, 2025**

**(CBCS New Pattern)**

**MICROBIOLOGY**

**Paper XV**

**(Industrial Microbiology)**

**(Friday, 25-4-2025)**

**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. What is stock culture ? Describe various methods used for maintenance of stock culture. 15

*Or*

Write notes on :

- (a) Laboratory and pilot plant fermenter. 8
- (b) Aeration and Agitation. 7

P.T.O.

WT

( 2 )

SA—85—2025

2. What is antibiotic ? Describe in detail penicillin fermentation. 15

*Or*

Write notes on :

(a) Filtration and centrifugation. 8

(b) Purification of fermentation product. 7

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

(a) Scope of industrial microbiology

(b) Continuous sterilization

(c) Foam fractionation

(d) Uses of citric acid.

SA—85—2025

2

This question paper contains 2 printed pages]

**SA—17—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**PHYSICS**

(Digital and Communication Electronics-XV)

**(Friday, 11-4-2025)**

**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 non-programmable calculator is allowed.

1. What is gate ? Explain AND, OR and NOT gates with their logic symbols, Boolean equations and truth tables. 15

*Or*

(x) Carry out the following arithmetic : 8

(a)  $(0110111)_2 + (001111)_2$

(b)  $(10111)_2 - (01101)_2$

(c)  $(110001)_2 \times (1110101)_2$

(d)  $(1110101)_2 \div (1001)_2$

(y) Discuss excess 3 code and gray code. 7

P.T.O.

WT

( 2 )

SA—17—2025

2. What are the types of modulations ? Derive an expression for frequency modulated wave. 15

Or

(x) Draw block diagram of basic communication system. Explain each block. 8

(y) Explain characteristics of radio receiver : 7

(i) Selectivity

(ii) Sensitivity

(iii) Fidelity.

3. Write short notes on any two : 10

(a) Universal properties of NAND gate

(b) De-Morgan's theorems

(c) Essential elements of A.M. transmitter

(d) Linear diode A.M. detector.

SA—17—2025

2

This question paper contains 2 printed pages]

**SA—18—2025**

**FACULTY OF SCIENCE**

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

**APRIL/MAY, 2025**

**PHYSICS**

**(Fiber Optic Communication-XV)**

**(Friday, 11-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—2 Hours*

*Maximum Marks—40*

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

(ii) Use of non-programmable calculator and log table is allowed.

1. Using simple ray theory describe the mechanism for the transmission of the light within the optical fibre. Briefly discuss with the aid of suitable diagram what is meant by acceptance angle for an optical fibre. Show that how this is related to the fibre numerical aperture and refractive indices for the fibre core and cladding. 15

*Or*

- (a) Describe various types of optical fibres. 8
- (b) Derive an expression for guided modes of step index multimode fibre. 7
2. Explain intermodal dispersion. Derive an expression for intermodal dispersion in multimode step index fibre. 15

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( 2 )

SA—18—2025

Or

- (a) Derive an expression for the cut-off wavelength. 8
- (b) A graded index fibre with a parabolic refractive index profile core has a R.I. at the core axis of 1.5 and a relative index difference of 1%. Estimate the maximum possible core diameter which allows a single mode operation at a wavelength of 1.3  $\mu\text{m}$ . 7
3. Write notes on (any *two*) : 10
- (i) Advantages of single mode fibre
  - (ii) Modes in graded index fibre
  - (iii) Normalized frequency
  - (iv) Snell's law.

SA—18—2025

2

This question paper contains 2 printed pages]

**SA—27—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**MARCH/APRIL, 2025**

**ZOOLOGY**

**Paper—XIV**

**(Ethology, Biometry and Bioinformatics)**

**(Tuesday, 15-4-2025)**

**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 suitable labelled diagrams wherever necessary.

1. Describe inborn or stereotyped animal behaviour—Taxis and Instincts with examples. 15

*Or*

(a) Describe protective and aggressive colouration. 8

(b) Describe Auditory communication. 7

2. Describe internet and its uses. 15

*Or*

(a) Describe types of classification of qualitative and quantitative data. 8

(b) Describe Histogram with examples. 7

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( 2 )

SA—27—2025

3. Attempt any *two* of the following :

10

- (a) Imprinting acquired animal behaviour
- (b) Tactile communication
- (c) Mean central tendency
- (d) Search engines.

SA—27—2025

2

This question paper contains 2 printed pages]

**SA—42—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**MARCH/APRIL, 2025**

**ZOOLOGY**

**Paper—XV(A)**

**(Applied Zoology—Aquaculture)**

**(Thursday, 17-4-2025)**

**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.

1. Explain cage culture. 15

*Or*

(a) Monoculture 8

(b) Intensive aquaculture 7

2. Describe pearl oyster culture. 15

*Or*

(a) Chemical properties of water. 8

(b) Advantages and disadvantages of aquatic weeds. 7

P.T.O.

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( 2 )

SA—42—2025

3. Attempt any *two* of the following :

10

- (a) Scope and importance of aquaculture
- (b) Domestic sewage
- (c) Biological control of aquatic weeds
- (d) Fish species for mariculture.

This question paper contains 2 printed pages]

**SA—43—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**MARCH/APRIL, 2025**

**(CBCS/New Pattern)**

**ZOOLOGY**

**Paper—II(B)—XV**

**(Applied Parasitology)**

**(Parasitic Nematodes and Arthropods)**

**(Thursday, 17-4-2025)**

**Time : 10.00 a.m. to 12.00 noon**

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*Time—2 Hours*

*Maximum Marks—40*

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

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

1. Describe morphology, life cycle, pathogenicity and treatment of *Enterobius vermicularis*. 15

*Or*

(a) Give the morphology and pathogenicity of *Heterodera* (Cyst nematode) 8

(b) Explain the life cycle of *tylenchulus* (Citrus nematode) 7

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SA—43—2025

2. Describe morphology, life cycle, diseases and control measures of ticks. 15

Or

(a) Explain biological controls of insects. 8

(b) Describe mosquitoes as a vector in the transmission of dengue and elephantiasis. 7

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

(a) Microfilaria

(b) General organization of plant Nematodes

(c) Botfly

(d) Morphology of Head louse.

This question paper contains 2 printed pages]

**SA—44—2025**

**FACULTY OF SCIENCE**

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

**MARCH/APRIL, 2025**

**(CBCS/New Pattern)**

**ZOOLOGY**

**Paper—XV**

**Applied Zoology**

**(Entomology—II)**

**(Thursday, 17-4-2025)**

**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 suitable labelled diagrams wherever necessary.

1. Describe classification, bionomics and control measures of red cotton bug.

15

*Or*

(a) Explain structure bionomics and control of head louse.

8

(b) Describe deer as non-insect animal pest

7

2. Describe in detail sericulture.

15

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SA—44—2025

*Or*

- (a) Explain physical control of Insect pest 8
- (b) Economic importance of Honey and bee wax. 7
3. Attempt any *two* of the following : 10
- (a) Midge fly
- (b) Birds
- (c) Queen
- (d) Insect net.

This question paper contains 2 printed pages]

**SA—45—2025**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**MARCH/APRIL, 2025**

**(CBCS/New Pattern)**

**ZOOLOGY**

**Paper—XV-D**

**(Applied Zoology D-Environmental Biology—II)**

**(Thursday, 17-4-2025)**

**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 diagram wherever necessary.

1. Define water pollution. Describe the kinds and sources of water pollution.

15

*Or*

(a) Oxides of Nitrogen as air pollutant : Sources and effects

8

(b) Ozone as a protector and destroyer.

7

2. Explain sources, effects and control of Radioactive pollution.

15

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SA—45—2025

*Or*

- |     |                                       |    |
|-----|---------------------------------------|----|
| (a) | The Environment (Protection) Act-1986 | 8  |
| (b) | Environmental Education in India.     | 7  |
| 3.  | Attempt any <i>two</i> :              | 10 |
| (a) | Eutrophication                        |    |
| (b) | Acid Rain                             |    |
| (c) | Noise Pollution                       |    |
| (d) | Trickling filter.                     |    |

SA—45—2025

2