U.G. DEGREE EXAMINATION – DECEMBER 2023.

Physics

Third Year

ATOMIC AND SOLID STATE PHYSICS

Time : 3 hours   Maximum marks : 70

SECTION A — (3 × 3 = 9 marks)

Answer any THREE questions out of Five questions in 100 words

All questions carry equal marks.

1. Define excitation potential and ionization potential.

2. State Zeeman Effect.

3. How the x-rays are produced?

4. Write the laws of photoelectric emission.

5. Compare crystalline and amorphous solids.

SECTION B — (3 × 7 = 21 marks)

Answer any THREE questions out of Five questions
in 200 words.

All questions carry equal marks.

6. Explain the various quantum numbers associated with the vector atom model.

7. Derive an expression for magnetic dipole moments due to orbital and spin motion of an electron.

8. State Mosley's law. What is its importance?

9. Explain the different kinds of photoelectric cells and its action.

10. Describe the symmetry elements in a cubic crystal.

SECTION C — (4 × 10 = 40 marks)

Answer any FOUR questions out of Seven questions
in 500 words.

All questions carry equal marks.

11. Describe the experimental determination of critical potential by Frank and Hertz method.

12. Explain the Debye's theory of normal Zeeman Effect.

13. Derive Bragg's law.

14. Discuss the powder crystal XRD method of finding the crystal system of a crystal.

15. Derive Einstein's photoelectric equation.

16. Explain the seven different crystal systems with example.

17. Draw and explain the crystal structure of NaCl with a diagram.

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U.G. DEGREE EXAMINATION – DECEMBER, 2023.

Physics

Third Year

WAVE MECHANICS AND NUCLEAR PHYSICS

Time : 3 hours　　　　　　　　Maximum marks : 70

PART A — (3 × 3 = 9 marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1.　Define matter waves.

2.　List out any three properties of wave function.

3.　What is mirror nuclei?

4.　Interpret nuclear isomerism.

5.　Mention the various types of nuclear reactions.

PART B — (3 × 7 = 21 marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. With neat sketch explain Davisson and Germer experiment in detail.

7. Derive Schrodinger's equations for time independent wave.

8. List out the various properties of alpha, beta and gamma rays

9. Examine Soddy Fajan's displacement law.

10. Discuss thermonuclear reactions in detail.

PART C — (4 × 10 = 40 marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. State uncertainty principle. Prove that electron not inside the nucleus with the help of uncertainty principle.

12. Discuss the following operators

    (a) Quantum operators,

    (b) Linear operator,

    (c) Hermitian operator,

    (d) Parity operators.

13. With proper examples discuss Liquid drop model.

14. Construct cyclotron and explain its principle and working function.

15. Outline the various application of various Radio isotopes in detail.

16. Explain with proper diagram and derive the equation for Particle in a box.

17. Construct and discuss various parts of Fast Breeder reactor in detail.

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U.G. DEGREE EXAMINATION – DECEMBER 2023.

Physics

Third Year

MATHEMATICAL PHYSICS

Time : 3 hours   Maximum marks : 70

SECTION A — (3 × 3 = 9 marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. What do you mean by constraints? Give any two examples.

2. Write the physical significance of Hamiltonian.

3. Define Beta and Gamma functions.

4. What is called Hermitian matrix? Give one example.

5. If F is a conservative field, prove that curl F is zero.

SECTION B — (3 × 7 = 21 marks)

Answer any THREE questions out of Five questions
in 200 words.

All questions carry equal marks.

6. Derive Lagrangian equation from D'Alembert's principle.

7. Discuss the application of Hamilton's equation of motion to Linear Harmonic oscillator.

8. Evaluate beta function.

9. Define the following

    (a) Symmetric and anti-symmetric matrix and

    (b) Orthogonal and unitary matrix.

10. (a) State Gauss divergence theorem and

    (b) State Stoke's theorem.

SECTION C — (4 × 10 = 40 marks)

Answer any FOUR questions out of Seven questions
in 500 words.

All questions carry equal marks.

11. Discuss the application of Lagrange's equation of motion to simple pendulum.

12. Derive the Hamilton's canonical equations of motion.

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13. Obtain the relation between beta and gamma function.

14. Determine the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$.

15. Verify Stoke's theorem for the vector field $A = (3x - 2y)i + x^2 zj + y^2 (z+1)k$ for a plane rectangular area with vertices at (0, 0), (1, 0), (1, 2), (0, 2) in the *x-y* plane.

16. State and Prove Cayley-Hamilton theorem.

17. Describe the line integral of a vector field around an infinitesimal rectangle.

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