B.Sc.-1 (Physics)
Semester – I

Physics- PH-101

Paper – I: Classical Mechanics and Theory of Relativity

Max. Marks: 40
Internal Assessment: 10
Time: 3 hours

Note:-

1. Nine Questions will be set in total.

2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/ No.

3. Four more questions are to be attempted, selecting one question out of twoquestions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

Unit 1: Basic concepts of Classical mechanics

Mechanics of single and system of particles, Conversion law of linear momentum, Angular momentum and mechanical energy for a particle and a system of particles, Centre of Mass and equation of motion, Constrained Motion.

Unit2: Generalized Notations

Degrees of freedom and Generalized coordinates, Transformation equations, Generalized Displacement, Velocity, Acceleration, Momentum, Force and Potential, Hamilton's variational principle, Lagrange's equation of motion from Hamilton's principle, Linear Harmonic oscillator, Simple pendulum, Atwood's machine.

Unit 3: Theory of relativity

Frame of reference, limitation of Newton's law of motion, Inertial frame of reference, Galilean transformation, Frame of reference with linear acceleration, Classical relativity- Galilean invariance, Transformation equation for a frame of reference- inclined to an

inertial frame and Rotating frame of reference, Non-inertial frames-The accelerated frame
of reference and rotating frame of reference , Effect of centrifugal and coriolis forces due to Earth's rotation, Fundamental frame of reference, Michelson- Morley's experiment, concept of Einstein's relativity.

Unit 4: Applications of theory of relativity

Special theory of relativity, Lorentz co-ordinate and physical significance of Lorentz invariance, Length Contraction, Time Dilation, Twin Paradox, Velocity addition theorem, Variation of mass with velocity, Mass energy equivalence, Transformation of relativistic momentum and energy, relation between relativistic momentum and energy, Mass, velocity, momentum and energy of zero rest mass.

Reference:

1. Classical Mechanics by H. Goldstien (2^{nd} Edition).
2. Berkely Physics Course. Vol. 1. Mechanics by E.M.Purcell
3. Concepts of Modern Physics by Arthur Beiser
4. Mechanics by D.S. Mathur

B.Sc.-1(Physics)

Semester – I

Physics- PH-102

Paper – II: Electricity, Magnetism and Electromagnetic theory

Max. Marks: 40
Internal Assessment: 10
Time: 3 hours

Note:-

1. Nine Questions will be set in total.
2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/ No.
3. Four more questions are to be attempted, selecting one question out of twoquestions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

Unit I: Vector background and Electric field

Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem. Derivation of electric field E from potential as gradient, Derivation of Laplace and Poisson equations, Electric flux, Gauss's Law, Mechanical force of charged surface, Energy per unit volume.

Unit 2: Magnetism

Magnetic induction, Magnetic flux, Solenoidal nature of vector field of induction, properties of $\vec{B}$ (i) $\vec{\nabla}.\vec{B} = 0$ (ii) $\vec{\nabla} \times \vec{B} = \mu\vec{j}$, Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory), Cycle of magnetization- hystresis loop (Energy dissipation, Hystresis loss and importance of Hystresis Curve)

Unit 3: Electromagnetism

Maxwell equations and their derivations, Displacement current, Vector and Scalar potentials, Boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation), Poynting vector and Poynting theorem.

Unit 4: A. C. Analysis

A.C. circuit analysis using complex variable with (a) Capacitance and Resistance (CR) (b) Resistance and Inductance (LR) (c) Capacitance and Inductance (LC) and (d) Capacitance, Inductance and Resistance (LCR), Series and parallel resonance circuit, Quality factor (sharpness of resonance).

Reference:

1. Electricity and Magnetism by Reitz and Milford (Prentice Hall of India).

2. Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala (Tata McGrawHill)