

B.Sc. Semester - 5 (Remedial) (CBCS) Examination**March/April-2023(Old Course)****ELECTRODYNAMICS AND RELATIVITY (CORE)****Time: 2:30 Hours****Marks: 70****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate marks.

- Q.1 (a) Answer the following questions in detail (Any one) 07**
1. Discuss in detail the conservation of angular momentum in electrodynamics.
 2. Discuss the Faraday's experiment and Faraday's law with derivation in detail.
- (b) Answer the following questions in brief (Any one) 04**
1. Derive the continuity equation.
 2. Explain the Maxwell's modification to the Ampere's law.
- (c) Answer the following questions in short (Any three) 03**
1. What is the unit of Inductance?
 2. The continuity equation is, $\frac{\partial \rho}{\partial t} = \dots\dots\dots$
 3. Define Poynting Vector.
 4. Magnetic monopoles do not exist. [True/False]
 5. Write the mathematical form of divergence of magnetic field.
- Q.2 (a) Answer the following questions in detail (Any one) 07**
1. Derive the classical wave equation.
 2. Explain energy and momentum in electromagnetic waves.
- (b) Answer the following questions in brief (Any one) 04**
1. Write a note on sinusoidal waves.
 2. Explain monochromatic plane waves.
- (c) Answer the following questions in short (Any three) 03**
1. Mechanical wave requires medium to propagate. [True/False]
 2. Define Intensity.
 3. Relation between wavelength λ and wave number k is given by $\lambda = \dots\dots\dots$
 4. The gamma rays have the highest wavelength among the electromagnetic spectrum. [True/False]
 5. What is transverse wave?
- Q.3 (a) Answer the following questions in detail (Any one) 07**
1. Explain the Coulomb Gauge.
 2. Explain retarded potential.
- (b) Answer the following questions in brief (Any one) 04**
1. Explain Jefimenko's equation.
 2. Explain Lorentz Gauge.
- (c) Answer the following questions in short (Any three) 03**
1. According to Maxwell's equation $\nabla \times \mathbf{E} = \dots\dots\dots$
 2. ∇^2 is known as d'Alembert operator. [True/False]
 3. $\mathbf{E} + \frac{\partial \mathbf{A}}{\partial t} = \dots\dots\dots$
 4. The curl of gradient of any scalar function is $\dots\dots\dots$
 5. What is the formula of retarded time?

- Q.4 (a) Answer the following questions in detail (Any one) 07**
1. Explain the reason behind the redness of the sunset and blueness of sky.
 2. Explain radiation from an arbitrary source.
- (b) Answer the following questions in brief (Any one) 04**
1. Explain radiation reaction.
 2. Derive Abraham-Lorentz formula for the radiation force.
- (c) Answer the following questions in short (Any three) 03**
1. An electric dipole consists of two like charges. [True/False]
 2. $P_{\text{electric}} / P_{\text{magnetic}} =$
 3. Define: Magnetic Dipole.
 4. In the case of point charge, the radiated power increases as the particle velocity increases. [True/False]
 5. When accelerate, their fields can transport energy irreversibly out to infinity.
- Q.5 (a) Answer the following questions in detail (Any one) 07**
1. Discuss: Lorentz transformation.
 2. Discuss: Relativistic Energy and Relativistic Momentum.
- (b) Answer the following questions in brief (Any one) 04**
1. Discuss the relativistic kinematics.
 2. Explain Galilean transformation.
- (c) Answer the following questions in short (Any three) 03**
1. Moving clocks run
 2. What do you mean by inertial reference frame?
 3. In every closed system, the total relativistic energy and momentum are not conserved. [True/False]
 4. Write Einstein's postulates of special theory of relativity.
 5. Write an equation for relativistic energy.
- *****