

B.Sc. Semester - 5 (Remedial) (CBCS) Examination**March/April-2022(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.

- Que-1(A) Answer the following questions (any one) (07)
1. Write a note on Poynting's theorem.
 2. Explain: Newton's third law in electrodynamics.
- Que-1(B) Answer the following questions (any one) (04)
1. Write Maxwell's Equations.
 2. Explain the flux rule for motional emf.
- Que-1(C) Answer the following questions (any three) (03)
1. Give SI unit of Charge.
 2. The continuity equation is, $\frac{\partial \rho}{\partial t} = \dots\dots\dots$
 3. Give the SI unit of Current Density.
 4. Define Poynting Vector.
 5. The mathematical expression of conservation of charge can be described using Continuity Equation. True/False.
- Que-2(A) Answer the following questions (any one) (07)
1. Write a note on energy and momentum in electromagnetic waves.
 2. Derive Wave Equation.
- Que-2(B) Answer the following questions (any one) (04)
1. Write a note on polarization in electromagnetic waves.
 2. Write a note on sinusoidal waves.
- Que-2(C) Answer the following questions (any three) (03)
1. Traveling speed of electromagnetic waves in empty space is, $v = \dots\dots\dots$
 2. Relation between wavelength λ and wave number k is given by $\lambda = \dots\dots\dots$
 3. Mechanical wave requires medium to propagate. True/False
 4. Define Intensity.
 5. Define Wave.
- Que-3(A) Answer the following questions (any one) (07)
1. Derive Jefimenko's Equations.
 2. Write a note on Retarded Potentials.
- Que-3(B) Answer the following questions (any one) (04)
1. Explain Lorentz Gauge.
 2. Explain Scalar and Vector Potentials.
- Que-3(C) Answer the following questions (any three) (03)
1. In Lorentz gauge $\nabla \cdot \mathbf{A} = \dots\dots\dots$
 2. $\nabla \cdot \mathbf{B} = \dots\dots\dots$
 3. $\square^2 \mathbf{A} = \dots\dots\dots$
 4. $\mathbf{E} + \frac{\partial \mathbf{A}}{\partial t} = \dots\dots\dots$
 5. The curl of gradient of any scalar function is $\dots\dots\dots$

- Que-4(A) Answer the following questions (any one) (07)
1. Explain the Lienard's generalization of Larmor formula.
 2. Explain the reason behind the redness of the sunset and blueness of sky.
- Que-4(B) Answer the following questions (any one) (04)
1. Write a note on radiation from an arbitrary source in case of approximation $r' \ll r$.
 2. Derive Abraham-Lorentz formula for the radiation force.
- Que-4(C) Answer the following questions (any three) (03)
1. An electric dipole consists of two like charges. True/False
 2. $P_{\text{electric}} / P_{\text{magnetic}} =$
 3. In the case of point charge, the radiated power increases as the particle velocity increases. True/False
 4. When accelerate, their fields can transport energy irreversibly out to infinity.
 5. The irreversible flow of energy away from the source is called
- Que-5(A) Answer the following questions (any one) (07)
1. Write a note relativistic dynamic.
 2. Explain proper time and proper velocity.
- Que-5(B) Answer the following questions (any one) (04)
1. Explain Lorentz contraction.
 2. Write a note on relativistic energy and momentum.
- Que-5(C) Answer the following questions (any three) (03)
1. Moving clocks run
 2. In every closed system, the total relativistic energy and momentum are not conserved. True/False
 3. Write Einstein's postulates of special theory of relativity.
 4. Moving objects are shortened. True/False
 5. Write an equation for relativistic energy.
