

B.Sc. Semester - 5 (CBCS) Examination
Oct/Nov. - 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.

- Que.1(A) Answer the following questions in detail. (any one) (07)
1. Write a note on Poynting's theorem.
 2. Discuss in detail the conservation of angular momentum in electrodynamics.
- Que.1(B) Answer the following questions in brief. (any one) (04)
1. Explain the flux rule for motional emf.
 2. Write Maxwell's Equations.
- Que.1(C) Answer the following questions in short. (any three) (03)
1. Give the SI unit of current Density.
 2. The continuity equation is, $\frac{\partial \rho}{\partial t} = \dots\dots\dots$
 3. Give SI unit of charge.
 4. Magnetic monopoles do not Exist. [True/False]
 5. What is the unit of Inductance?
- Que.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.
- Que.2(B) Answer the following questions in brief. (any one) (04)
1. Explain monochromatic plane waves.
 2. Obtain the formula for radiation pressure when light falls on perfect absorber.
- Que.2(C) Answer the following questions in short. (any three) (03)
1. The wavelength of ultraviolet waves is smaller than infrared waves. [True/False]
 2. Define wave.
 3. Relation between wavelength λ and wave number k is given by $\lambda = \dots\dots\dots$
 4. The gamma rays have the highest frequency among the electromagnetic spectrum. [True/False]
 5. Traveling speed of electromagnetic waves in empty space is, $v = \dots\dots\dots$
- Que.3(A) Answer the following questions in detail. (any one) (07)
1. Explain the coulomb gauge.
 2. Derive Jefimenko's equations.
- Que.3(B) Answer the following questions in brief. (any one) (04)
1. Explain Lorentz gauge.
 2. Explain scalar and vector potentials.
- Que.3(C) Answer the following questions in short. (any three) (03)
1. According to Maxwell's equation $\nabla \cdot \mathbf{B} = \dots\dots\dots$
 2. $\nabla \times$ is known as momentum operator. [True/False]
 3. The direction of magnetic field of a moving point charge is always $\dots\dots\dots$ to the electric field.
 4. The curl of gradient of any scalar function is $\dots\dots\dots$
 5. What is the formula of retarded time?

- Que.4(A) Answer the following questions in detail. (any one) (07)
1. Explain radiation from an arbitrary source.
 2. Write a note on magnetic dipole radiation.
- Que.4(B) Answer the following questions in brief. (any one) (04)
1. Explain radiation reaction.
 2. Explain the reason behind the redness of the sunset and blueness of sky.
- Que.4(C) Answer the following questions in short. (any three) (03)
1. An electric dipole consists of four like charges. [True/False]
 2. $P_{\text{electric}} / P_{\text{magnetic}} = \underline{\hspace{2cm}}$
 3. Define: magnetic dipole.
 4. In the case of point charge, the radiated power decreases as the particle velocity increases. [True/False]
 5. The irreversible flow of energy away from the source is called
- Que.5(A) Answer the following questions in detail. (any one) (07)
1. Discuss: Lorentz transformation.
 2. Explain proper time and proper velocity.
- Que.5(B) Answer the following questions in brief. (any one) (04)
1. Discuss the relativistic kinematics.
 2. Write a note on relativistic energy and momentum.
- Que.5(C) Answer the following questions in short. (any three) (03)
1. Moving clocks runs slower. [True/False]
 2. What do you mean by inertial reference frame?
 3. Moving object are not shortened. [True/False]
 4. Write Einstein's postulates of special theory of relativity.
 5. Write an equation for relativistic energy.
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