

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

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- Q.1 (a) Answer the following questions in detail (Any one) 07
1. Write a note on Poynting's theorem.
 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. Write Maxwell's Equations.
- (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. Write the Faraday's law in integral form.
 4. Magnetic monopoles do not exists. [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. Write a note on polarization in electromagnetic waves.
- (b) Answer the following questions in brief (Any one) 04
1. Write a note on sinusoidal waves.
 2. Obtain the formula for radiation pressure when light falls on perfect absorber.
- (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 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. Traveling speed of electromagnetic waves in empty space is, $v = \dots\dots\dots$
- Q.3 (a) Answer the following questions in detail (Any one) 07
1. Explain the Coulomb Gauge.
 2. Write a note on Electric and Magnetic fields of moving charge with constant velocity.

- (b) Answer the following questions in brief (Any one) 04
1. Explain Jefimenko's equation.
 2. Explain Scalar and Vector Potentials.
- (c) Answer the following questions in short (Any three) 03
1. According to Maxwell's equation $\nabla \times \mathbf{E} = \dots\dots\dots$
 2. $\square$ is known as d'Alembert 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?
- 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. Write a note on Magnetic dipole radiation.
- (b) Answer the following questions in brief (Any one) 04
1. Discuss power radiated by a point charge.
 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. What is the equation of Abraham – Lorentz formula?
 4. In the case of point charge, the radiated power increases as the particle velocity increases. True/False
 5. The irreversible flow of energy away from the source is called $\dots\dots\dots$
- Q.5 (a) Answer the following questions in detail (Any one) 07
1. Explain proper time and proper velocity.
 2. Discuss: Relativistic Energy and Relativistic Momentum.
- (b) Answer the following questions in brief (Any one) 04
1. Explain Galilean transformation.
 2. Explain Lorentz contraction.
- (c) Answer the following questions in short (Any three) 03
1. Moving clocks run $\dots\dots\dots$
 2. What do you mean by inertial reference frame?
 3. Moving objects are shortened. True/False
 4. Write Einstein's postulates of special theory of relativity.
 5. Write an equation for relativistic energy.
