

B.Sc. Semester - 5 (CBCS) Examination
Oct/Nov. - 2021(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 details. (Any One Out of Two) (07)**
1. Discuss the Faraday's experiment and Faraday's law with derivation in detail.
 2. Discuss in detail the conservation of angular momentum in electrodynamics.
- Q.1(B) Answer the following questions in Brief. (Any One Out of Two) (04)**
1. Explain the Maxwell's modification to the Ampere's law.
 2. Derive the continuity equation.
- Q.1(C) Answer the following question shortly. (Any Three Out of Five) (03)**
1. What is the unit of Inductance?
 2. Write Lorentz force law.
 3. Write the Faraday's law in integral form.
 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 details. (Any One Out of Two) (07)**
1. Derive the classical wave equation.
 2. Explain energy and momentum in electromagnetic waves.
- Q.2(B) Answer the following questions in Brief. (Any One Out of Two) (04)**
1. Explain monochromatic plane waves.
 2. Obtain the formula for radiation pressure when light falls on perfect absorber.
- Q.2(C) Answer the following question shortly. (Any Three Out of Five) (03)**
1. The wavelength of ultraviolet waves is smaller than infrared waves. [True/False]
 2. What is transverse wave?
 3. Write a formula relating wavelength λ and wave number k .
 4. The gamma rays have the highest wavelength among the electromagnetic spectrum. [True/False]
 5. Write the three dimensional form of wave equation.
- Q.3(A) Answer the following questions in details. (Any One Out of Two) (07)**
1. Explain retarded potential.
 2. Write a note on Electric and Magnetic fields of moving charge with constant velocity.
- Q.3(B) Answer the following questions in Brief. (Any One Out of Two) (04)**
1. Explain the Coulomb Gauge.
 2. Explain Jefimenko's equation.
- Q.3(C) Answer the following question shortly. (Any Three Out of Five) (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 point charge is always $\dots\dots\dots$ to the electric field.
 4. What is retarded time?
 5. Write the formula for E in generalized coulomb field?

- Q.4(A) **Answer the following questions in details. (Any One Out of Two)** (07)
1. Write a note on Magnetic dipole radiation.
 2. Explain radiation from an arbitrary source.
- Q.4(B) **Answer the following questions in Brief. (Any One Out of Two)** (04)
1. Discuss power radiated by a point charge.
 2. Explain radiation reaction.
- Q.4(C) **Answer the following question shortly. (Any Three Out of Five)** (03)
1. Define: Electric Dipole.
 2. Define: Magnetic Dipole.
 3. What is the equation of Abraham – Lorentz formula?
 4. What is the value of γ in Larmor formula?
 5. Define: Radiation.
- Q.5(A) **Answer the following questions in details. (Any One Out of Two)** (07)
1. Discuss: Relativistic Energy and Relativistic Momentum.
 2. Discuss: Lorentz transformation.
- Q.5(B) **Answer the following questions in Brief. (Any One Out of Two)** (04)
1. Explain Galilean transformation.
 2. Discuss the relativistic kinematics.
- Q.5(C) **Answer the following question shortly. (Any Three Out of Five)** (03)
1. What is rest mass? Explain in brief.
 2. What do you mean by inertial reference frame?
 3. Explain Newtonian velocity addition rule.
 4. Write Einstein's velocity addition rule.
 5. What is final formula for Lorentz contraction?
