

B.Sc. Semester - 6 (CBCS) Examination
March/April-2024 (NEW COURSE)
Electrodynamics & Relativity (Core (New))

Time: 2:30 Hours**Marks: 70****Instructions:**

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

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- Que.1(A) Answer the following questions. (any two) (10)
- 1) Derive Gauss's Law for dielectrics.
 - 2) Derive equation for surface bound charge density and volume bound charge density.
 - 3) Obtain the expressions of torque and force acting on a magnetic dipole when placed in a non-uniform magnetic field.
- Que.1(B) Answer the following questions. (any one) (04)
- 1) Derive relation between susceptibility, permeability and dielectric constant.
 - 2) Obtain the expression of ampere's law in magnetized material.
- Que.2(A) Answer the following questions. (any two) (10)
- 1) Explain energy stored in magnetic field.
 - 2) Write Maxwell's equations and Maxwell's modification in ampere's law.
 - 3) Derive the expression of Poynting's theorem in differential version.
- Que.2(B) Answer the following questions. (any one) (04)
- 1) Define inductance and write a note on mutual inductance.
 - 2) Write a note on motional emf.
- Que.3(A) Answer the following questions. (any two) (10)
- 1) Explain energy and momentum in electromagnetic waves.
 - 2) Derive the boundary conditions: Reflection and Transmission.
 - 3) Derive wave equation.
- Que.3(B) Answer the following questions. (any one) (04)
- 1) $f_1 = A \sin[b(z - vt)]$ and $f_2 = A e^{-b(z-vt)^2}$, prove both functions are valid or invalid wave function.
 - 2) Explain polarization and derive wave equation for E and B.
- Que.4(A) Answer the following questions. (any two) (10)
- 1) Explain Retarded Potential.
 - 2) Explain Lorentz gauge and Coulomb gauge.
 - 3) Explain Lienard-Wiechert potentials.
- Que.4(B) Answer the following questions. (any one) (04)
- 1) Explain gauge transformation.
 - 2) Explain scalar and vector potential.
- Que.5(A) Answer the following questions. (any two) (10)
- 1) Explain twin paradox in detail.
 - 2) Describe Lorentz transformation.
 - 3) Obtain expression of proper time and velocity.
- Que.5(B) Answer the following questions. (any one) (04)
- 1) Describe barn and ladder paradox.
 - 2) Explain relativistic energy and momentum.
