

23U303

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Name: .....

Reg.No: .....

**THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2024**

(CBCSS - UG)

(Regular/Supplementary/Improvement)

**CC19U PHY3 B03 / CC20U PHY3 B03 - ELECTRODYNAMICS - I**

(Physics - Core Course)

(2019 Admission onwards)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

**Part A** (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. Prove the law of cosines
2. Explain curl of a vector field.
3. Explain the physical meaning of Dirac delta function in one dimension.
4. Starting from the integral form of Gauss flux theorem, obtain its differential form.
5. Show that potential obeys superposition principle.
6. Write the boundary conditions for electric field vector E.
7. Show that the potential is constant throughout a conductor.
8. Explain atomic polarizability.
9. What is the difference between E and D?
10. Write the significance of electric displacement.
11. What is Lorentz force? Write down Lorentz equation.
12. The Ampere's law uniquely determines B, if we know all the current densities. But it does not always give H uniquely. Why?

**(Ceiling: 20 Marks)**

**Part B** (Short essay questions - Paragraph)

Answer *all* questions. Each question carries 5 marks.

13. State and explain the fundamental theorems of Divergence and curl.
14. For a charge q at  $(x', y', z')$ , find the expression for field at  $(x, y, z)$ .
15. A rectangular coil of sides 8 cm x 6 cm having 2000 turns and carrying a current of 200 mA is placed in a uniform magnetic field of 0.2T directed along the positive x-axis. What is the maximum torque the coil can experience?

16. A solenoid having a length of 25cm, radius 1 cm and containing 400 turns carries a current of 8 A. Calculate the magnetic induction at the centre and at its ends? Also calculate the magnetic moment of the solenoid?
17. Find an expression for A for an infinitely long straight wire with current I.
18. Derive  $\mathbf{J} \times \mathbf{M} = \nabla \times \mathbf{M}$ .
19. Obtain the relation between magnetic susceptibility and permeability of a medium.

**(Ceiling: 30 Marks)**

**Part C (Essay questions)**

Answer any *one* question. The question carries 10 marks.

20. Obtain an expression for the electric potential and field due to polarized object. Also obtain expressions for the volume bound charge and surface bound charge in terms of P.
21. Discuss the effect of magnetic field on atomic orbits.

**(1 × 10 = 10 Marks)**

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