33

D3BPH2101 Reg.No.....

Name: .....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022

(Regular/Improvement/Supplementary)

PHYSICS

GPHY3B03T: ELECTRODYNAMICS - I

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 Marks)

1. What is magnetic vector potential? Give the relation between magnetic vector potential and magnetic field.
2. Distinguish between linear and nonlinear dielectric medium.
3. What do you mean by the cross-product of two vectors? What is its geometrical meaning?
4. What is an equipotential surface? Give an example.
5. What are ferromagnetic materials?
6. Distinguish between free charges and bound charges.
7. Give the Gauss's law in dielectric media.
8. Show that the electrostatic field inside a charged hollow sphere is zero.
9. Give the Clausius - Mossotti relation.
10. Give the basic features of one dimensional Dirac Delta function?
11. Show that electrostatic energy does not obey the superposition principle.
12. What do you mean by the electric susceptibility tensor?

SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 Marks)

13. Derive the expression for the magnetic field inside a solenoid.
14. Explain the spherical polar coordinate system and write down the relation with Cartesian coordinates.
15. Explain the geometrical interpretation of the gradient of a scalar function.
16. Derive the electrostatic boundary conditions.
17. A solenoid of 600 turns and carrying a current of 1A has a length of 30 cm and radius 6 cm. Find the magnetic field at (i) the mid-point (ii) a point on the axial line at 10 cm from one end.
18. Derive the expression for the force acting on a polar molecule kept in a non-uniform electric field.
19. Derive differential form of Ampere's circuital theorem.

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. Discuss the effect of magnetic field on atomic orbits.
21. a) State Gauss's law in electrostatics. Obtain differential form of Gauss's law.
    b) Define electric potential and prove that the electric field is the negative gradient of electric potential.

(1× 10 = 10 Marks)