V Semester B.Sc. Degree (CBCSS – Sup./Imp.)
Examination, November 2021
(2015 – '18 Admns)
CORE COURSE IN PHYSICS
5B06 PHY : Electrodynamics – I

Time : 3 Hours

Max. Marks : 40

SECTION – A

Answer **all** questions (Very short type. **Each** question carries 1 mark).

1. Integral form of Gauss's law is _____

2. Polarisation is proportional to _____

3. The divergence of the Electric displacement is equal to _____

4. Two parallel wires carrying current in the same direction attract each other because of _____

(4×1=4)

SECTION – B

Answer **any seven** questions (Short answer type. **Each** question carries 2 marks).

5. State Coulomb's law. Write down the expression.

6. Write down Poisson's equation and explain its significance.

7. What is meant by electric potential ?

8. Explain susceptibility and permittivity in the case of linear dielectrics.

9. Write down the boundary conditions for E and D.

10. What is meant by electric displacement vector ?

11. Define current and write down its unit.

12. What is Lorentz force ? Write down the relation.

13. State Biot Savart law.

14. What is magnetic vector potential ?

(7×2=14)

SECTION – C

Answer **any four** questions. (Short essay/problem type. **Each** question carries **3** marks).

15. A point charge of 1.0×10^{-4} coulomb is at the centre of a cubical Gaussian surface 0.5 m on edge. What is the flux for the surface ?

16. Find the electric field due to a uniformly charged spherical conductor (Hollow or solid).

17. Show that the energy of a dipole in an electric field is given by $U = -\vec{p} \cdot \vec{E}$.

18. A dielectric cube of side a centered at the origin carries a frozen in polarization $\vec{p} = k\vec{r}$, where k is a constant. Find all the bound charges (ρ_b and σ_b).

19. A wire of length 60 cm and mass 10 kg is suspended by two vertical wires at its ends in a magnetic field of 0.4 T acts perpendicular to the wire. What is the magnitude of current required to remove the tension in the supporting wires ?

20. A charge of 3.2×10^{-19} C makes 60 revolutions per minute in a circular orbit of radius 0.5 Å. What is the magnetic field at the centre of the circular orbit ?

(4×3=12)

SECTION – D

Answer **any two** questions (Long essay type. **Each** question carries **5** marks).

21. State and prove Gauss's law. Find the electric field due to a charged cylindrical conductor of infinite length.

22. Derive Clausius Mossotti relation.

23. State and explain Ampere's circuital theorem. Prove it and also deduce the differential form of it.

24. Derive an expression for the magnetic field due to a straight conductor carrying steady current using Biot Savart law.

(2×5=10)