K18U 1486

Reg. No. : .....

Name : .....

V Semester B.Sc. Degree (CBCSS - Reg./Sup./Imp.) Examination, November 2018

(2014 Admn. Onwards)

CORE COURSE IN PHYSICS

5B06 PHY : Electrodynamics – I

Time : 3 Hours Max. Marks : 40

Instructions *:1) Section **A** : Answer **all** questions (Very short answer type. **Each** question carries **1** mark).*

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

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

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

SECTION – A

1. Inside a charged hollow spherical conductor, the potential is _____
2. Write Poisson's equation.
3. The dielectric constant of water is 80. Its permittivity is _____
4. The equation of continuity expresses the conservation of _____ **(4×1=4)**

SECTION – B

5. State Biot-Savart's law.
6. Give any two properties of equipotential surfaces.
7. Show that $\nabla \times E = 0$.
8. Obtain Poisson's equation from Gauss's law.
9. Derive an expression for the energy of a dipole in an electric field.

P.T.O.

10. Derive the relation between surface current and surface charge densities.

11. What is electric displacement vector ? Write its unit.

12. Distinguish between polar and non-polar molecules. Give examples.

13. Find the electric field inside a charged conducting spherical shell using Gauss's theorem. Hence find the electrostatic potential.

14. What are the boundary conditions on potential ? **(7×2=14)**

SECTION – C

15. A parallel plate capacitor having capacitance C is half filled with dielectric constant K. What is the new capacitance ?

16. A certain charge Q is to be divided into two parts q and Q-q. What is the relationship of Q to q if the two parts placed a given distance apart are to have a maximum Coulomb repulsion ?

17. Find the energy of a uniformly charged spherical shell of total charge q and radius R.

18. Find the force between two straight parallel conductors carrying currents.

19. A toroid has a core (non-ferromagnetic) of inner radius 25 cm and outer radius 26 cm around which 3000 turns of a wire are wound. If the current in the wire is 11 A, what is the magnetic field inside the core of the toroid ?

20. A wire 1 m long carries a current of 10 A and makes an angle of 30° with a uniform magnetic field B = 1.5 T. Calculate the magnitude and direction of the force on the wire. **(4×3=12)**

SECTION – D

21. Derive an expression for the trajectory of the charged particle moving in transverse electric and magnetic field.

22. Derive an expression for the potential of a uniformly charged conducting sphere inside and outside.

23. Derive the Clausius-Mosotti relation.

24. Derive the differential and integral form of Gauss's law for the field polarization vector P. **(2×5=10)**

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