C 3965

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Name...................................

Reg. No...................................

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2016

(CUCBCSS—UG)

Core Course—Physics

PHY 4B 04/APY 4B 04—ELECTRODYNAMICS—I

Time : Three Hours

Maximum : 80 Marks

Section A

Answer all questions in a word or phrase.

Each question carries 1 mark.

1. Potential energy of a system of two charges, $U =$ ———.

2. Electric potential is ——— across any boundary.

3. Intensity of magnetic field at the center of a current carrying circular coil, $B =$ ———.

4. Laplace equation in two dimension is ———.

5. ——— is the S.I. unit of magnetic field strength.

State whether the statement is True *or* False :

6. Dipole moment is a vector quantity.

7. Permeability of diamagnetic substance is always greater than unity.

8. Permanent magnetic material must have high coercivity.

9. Area is a vector quantity.

10. If the centre of gravity of the positive nuclei and the electron cloud coincide, the molecule is called polar molecule.

(10 × 1 = 10 marks)

Section B

Answer all questions.

Write each answer in two or three sentences.

Each question carries 2 marks.

11. During lightening, we are safe inside a car. Why ?

12. Why electrostatic force is considered as a conservative force ?

13. What's the working principle of a cyclotron ?

14. State the Gauss's theorem in magnetostatics.

Turn over

15. Explain magnetizing field and magnetic field.

16. Can a system have magnetic moment even if its net charge is zero ? Explain.

17. Explain electrostatic pressure.

$(7 \times 2 = 14$

Section C

Answer any five questions.
Each question carries 4 marks.

18. Explain Maxwell's equations of electrostatics.

19. How is atomic polarizability and polarization related ?

20. Explain bound charge.

21. Derive Poisson's equation.

22. Derive the expression for the energy of a charged capacitor.

23. Explain hysteresis.

24. Distinguish between para, dia and ferromagnetic materials.

$(5 \times 4 = 20$ m

Section D

Answer any four questions.
Each question carries 4 marks.

25. A dielectric slab of thickness 0.75 cm and dielectric constant 4 is placed between the plates parallel plate capacitor of area 0.02 m² and separation 2 cm. Calculate the change in capacita on the introduction of a dielectric.

    What would be the change if the slab were conducting ?

26. Three point charges, each of +250 μC are placed at the three corners of an equilateral tria Calculate the resulting electric potential at the center of the triangle, which is at a distan 18 cm from each corner.

27. The electron in a hydrogen atom circles around the proton with a speed of 2×10^6 m/s in an of radius 5.3×10^{-11} m. Calculate :

    (a) The equivalent current.

    (b) Magnetic field strength produced at the proton.

28. An iron rod of 0.2 cm^2 area of cross-section is subjected to a magnetizing field of 1200 Am^{-1}. If the susceptibility of iron is 599, calculate :

  (a) Permeability.

  (b) Magnetic flux produced.

29. A horizontal overhead power line carries a current of 60 A from south to north. Calculate the magnitude and direction of magnetic field due to the current at a point 2.5 m above the line.

30. Derive the expression of torque experienced by a dipole in a non-uniform electric field.

31. Current passing through a solenoid is 2 A. What is the magnetizing field (H) if it is 2 m long and contains 400 turns. Find intensity of magnetic field (B) in free space.

$$(4 \times 4 = 16 \text{ marks})$$

Section E

Answer any two questions.
Each question carries 10 marks.

32. Discuss electrostatics boundary conditions and first and second uniqueness theorem.

33. (a) State Ampere's law.

  (b) Derive the expression for the magnetic field due to :

    (i) Solenoid.

    (ii) Toroid.

34. (a) State and prove Gauss's law in the presence of dielectric.

  (b) What are the three electric vectors ? Derive the relation connecting them.

35. Derive the expression for :

  (a) The energy of a continuous charge distribution.

  (b) Electrostatic energy density.

$$(2 \times 10 = 20 \text{ marks})$$