3295 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2017

(CUCBCSS—UG)

Physics/Applied Physics

PHY 4B 04/APY 4B 04—ELECTRODYNAMICS—I

: Three Hours Maximum : 80 Marks

Section A

Answer **all** *questions in a word* **or** *phrase.*
Each question carries 1 *mark.*

The number of electric field lines penetrating normal to a surface is called ————.

For static charge, curl of E is ————.

The induced electric dipole moment per unit volume is called ————.

Maxwell introduced the concept of ———— current.

Above curie point temperature, a ferromagnetic material would become ————.

whether the statement is True *or* False (6-10) :

CO_2 is an example of non-polar molecule.

For Ferromagnetic material susceptibility is negative and small.

In the interior of a dielectric kept in a uniform field, the net charge is zero.

$\nabla^2 V = -\rho/\varepsilon_0$ is called Poisson's equation.

S.I unit of magnetic moment is Am.

(10 × 1 = 10 marks)

Section B

Answer **all** *questions.*
Write each answer in two **or** *three sentences.*
Each carries 2 *marks.*

State curie's law.

What is meant by dielectric breakdown ?

Distinguish between permeability and permittivity.

Turn over

14. State ampere's force law.

15. What is magnitude vector potential ?

16. Write the relation connecting M, B, and H.

17. Draw a diagram to show the variation of electric field of a charged metallic sphere with dista

(7 × 2 = 14 ma

Section C

Answer any **five** *questions ; each carries* 4 *marks.*

18. Derive the expression for the capacitance of two concentric metal shells with radii a and b.

19. Derive the equation, $\mathbf{E} = -\nabla V$.

20. State first and second law of uniqueness theorem.

21. Explain cyclotron motion and cyclotron frequency.

22. Derivethe relation connecting dielectric constant and electric susceptibility.

23. Derive Ampere's law.

24. Explain electrostatic boundary conditions.

(5 × 4 = 20 ma

Section D

Answer any **four** *questions.*
Each answer carries 4 *marks.*

25. Show that the energy of a magnetic dipole in a magnetic field B is given by $U = -\mathbf{m} \cdot \mathbf{B}$.

26. Four grams of gold is beaten into a thin leaf of area 1 m^2. A small piece is cut-off from this placed upon a conductor. Calculate the charge density required by the conductor, so that the pi of gold is jut lifted up.

27. A parallel plate capacitor consists of two square plates of sides 4 cm, separated by 1 cm. A sulp slab of thickness 5 mm is placed on the lower plate. Calculate the capacitance of the capaci Dielectric constant of sulphur is 4.

28. The horizontal component of magnetic flux density of earth's magnetic field (B) at a plac 0.40×10^{-4}T. What is the horizontal component of magnetic intensity (H) ?

29. An electron with energy 20 KeV enters a uniform magnetic field of 0.02 T. Find the cyclotron frequency and radius of the circle it will describe. ($m_e = 9.1 \times 10^{-31}$Kg, $q = 1.6 \times 10^{-19}$ C).

30. Calculate the magnitude of **D** (electronic displacement) and **P** (polarization) in a dielectric material in which E = 0.20 MV/m and electric susceptibility is 4.25.

31. What is the magnetic field at a point on the axis of a long solenoid of length 3 m, 600 turns, when a current of 2 A flows through it.

(4 × 4 = 16 marks)

Section E

Answer any **two** *questions.*
Each answer carries 10 *marks.*

32. Use Gauss's law to find the electric field :

    (a) Outside a uniformly charged solid sphere of radius R and total charge q.

    (b) At a distance from an infinite plane of uniform surface charge density.

33. (a) State and explain Biot Savart's law.

    (b) Derive an expression for the magnetic field due to a circular loop of current at a point on axis of the coil.

34. (a) Derive the expression showing the effect of magnetic field on atomic orbit.

    (b) Derive the relation connecting magnetic susceptibility and permeability.

35. (a) Explain atomic polarizability and polarization vector.

    (b) Derive the expression for the torque experienced by a polar molecule (dipole) in a non-uniform field

(2 × 10 = 20 marks)