M 6152

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CCSS – Reg./Supple./Improv.) Examination, May 2014
CORE COURSE IN PHYSICS
6B11 PHY : Electrodynamics – II

Time : 3 Hours Max. Weightage : 30

SECTION – A

Choose the correct answer, **each** bunch carries a weightage of **one**.

1. i) Unit of magnetic moment is
   a) J-T b) J/T c) J/m d) J-m

   ii) The ratio of intensity of magnetic field at the centre of a very long solenoid to that at the extreme ends is
   a) 2 b) 1/2 c) 4 d) 1/4

   iii) Torque acting on a dipole is maximum by a magnetic field when,
   a) $\theta = 0$ b) $\theta = 90$
   c) $\theta = 45$ d) $\theta = 30$

   iv) The inductance of a coil depends on
   a) number of turns of coil b) type of core
   c) spacing between the turns d) all of the above

2. i) Induced electric field is
   a) conservative b) non conservative
   c) both d) none of these

   ii) For an ideal transformer on load
   a) $\frac{E_p}{E_s} = \frac{N_p}{N_s}$ b) $\frac{E_p}{E_s} = \frac{N_s}{N_p}$
   c) both a) and b) d) none of a) and b)

P.T.O.

iii) The trajectory of the charged particle in an electric field within the parallel plates is

a) parabola b) hyperbola c) circle d) straight line

iv) Calculate the radius of path of an electron in a magnetic field of induction 10^{-4} Wb/m^2 perpendicular to its path (velocity of electron is 1.9×10^8 m/s)

a) 10.81 m b) 10.81 cm c) 1.081 m d) 1.081 cm **(2×1=2)**

SECTION – B

Answer **any six** questions, **each** question carries a weightage of **one**.

3. Define ferromagnetism.
4. Define torque on a magnetic dipole.
5. Define mutual induction.
6. Define Coulomb Gauge.
7. What is radiation pressure ?
8. Give the characteristics of electromagnetic waves.
9. What are the common losses in transformers ?
10. What is Hall effect ? **(6×1=6)**

SECTION – C

Answer **any nine** questions, **each** question carries a weightage of **two**.

11. Show that Amperes' circuital law in magnetic materials is independent of shape of path.
12. Explain a hysteresis loop.
13. Explain the concept of magnetic susceptibility and permeability.
14. A copper disc of radius 10 cm rotates 1200 times per minute with its plane perpendicular to a uniform magnetic field. If the induced e.m.f. between the centre and the edge of the disc is 6.284 millivolt, calculate the flux density.

15. Calculate the self inductance of a solenoid of 200 turns, length 25 cm and radius 5 cm having an air core.

16. Derive an expression for energy stored in a magnetic field.

17. On the surface of earth the energy received is 1.33 kW/m^2 from the sun. Calculate the electric field associated with sunlight (on surface of earth) assuming that it is essentially monochromatic (λ = 6000 A°) Given $\epsilon = 9 \times 10^{-12}$ S.I. units.

18. Derive the wave equation for E and B for electromagnetic waves in vacuum.

19. Prove that electromagnetic waves are transverse in nature.

20. A positive ion of charge q and mass m is accelerated by a potential difference V, passes with a constant velocity through the space between two plates separated by a distance d. Show that the transit time between plates is $d/(2q\ V/m)^{1/2}$.

21. A copper strip 2 cm wide and 1 mm thick is placed in a magnetic field of magnitude 1.5 W/m^2 in the Z-direction. If a current of 100 A is set up in the strip along the X-direction, calculate the Hall potential difference across the strip given the number of electrons per cubic metre = 8.4×10^{28} m^3.

22. Explain the working of magnetohydrodynamics generator. **(9×2=18)**

SECTION – D

Answer **any one** question, **each** question carries a weightage of **four**.

23. a) What do you mean by magnetic scalar potential ?

    b) Show that for a current loop the magnetic scalar potential is $\phi_m = \frac{\mu_0}{4\pi} I\Omega$ where symbols have usual meanings.

    c) Discuss the equivalence of magnetic dipole and a current carrying coil.

24. Describe a cathode ray oscilloscope. Explain its working. Give its uses. **(1×4=4)**
