



**II. FILL IN THE BLANKS:****(5 X 1 = 5)**

11. Write the Laplace equation for electrostatic field \_\_\_\_\_.
12. In the external electric field, the nonpolar dielectric materials get \_\_\_\_\_ polarization.
13. The direction of Lorentz force on a charge is \_\_\_\_\_ to velocity and magnetic field.
14. Magnetic susceptibility is the ratio of \_\_\_\_\_ and \_\_\_\_\_.
15. The equation for energy stored per unit volume in magnetic field is \_\_\_\_\_.

**III. ANSWER BRIEFLY:****(5 X 2 = 10)**

16. Define electric potential
17. State Gauss's law in the presence of dielectrics.
18. What is deadbeat of ballistic galvanometer?
19. Define magnetization.
20. Give the relation between self-inductance and mutual-inductance.

**SECTION – B****(5 X 6 = 30)****ANSWER ANY FIVE QUESTIONS:**

21. Calculate the electrostatic force and gravitational force between the protons and electrons in free space, when they are separated by a distance of  $0.5 \times 10^{-10}$  meter given that the charge of a proton is  $1.6 \times 10^{-27}$  kg, mass of electron =  $9.1 \times 10^{-31}$  kg and  $G = 6.67 \times 10^{-11} \text{Nm}^2 \text{kg}^{-2}$ .
22. A rod of magnetic material 0.5m in length has a coil of 200 turns wound over it uniformly. If a current of 2 amperes is sent through it, calculate a) the magnetizing field H, b) the intensity of magnetization M, c) the magnetic induction B and d) the relative permeability  $\mu_r$  of the material. Given  $\chi_m = 6 \times 10^{-3}$ .
23. The radii of the inner and outer spheres of a spherical capacitor are  $4 \times 10^{-2}$  m and  $6 \times 10^{-2}$  m. If the dielectric medium between the plates is air, calculate the capacitance of the spherical capacitor if the outer is earthed and the inner sphere is positively charged.
24. A magnetizing field of  $50 \text{Am}^{-1}$  produces a magnetic field induction 0.024T in a bar of length 8 cm and area of cross-section  $1.5 \text{cm}^2$ . Calculate i) the magnetic permeability ii) the magnetic susceptibility.
25. An air solenoid of 80 cm. length has 500 turns and its circular cross-section has a diameter of 2 cm. Calculate a) the self-inductance of the solenoid b) the self linked flux when the current in the solenoid is 2 amp c) the rate of change of current in the solenoid that will produce a self induced e.m.f of 0.3 volt.
26. What is self-inductance? Obtain the expression for self-inductance.
27. Derive the equation for magnetic field produced by toroid. Mention its application.

**SECTION - C****(3 X 15 = 45)****ANSWER ANY THREE QUESTIONS:**

28. (a) Discuss about the energy of a continuous charge distribution.  
(b) What are electrostatic boundary conditions?
29. (a) Obtain the equation for concentric spherical capacitor.  
(b) Discuss about the change in energy due to the presence of dielectric in a capacitor.
30. (a) Describe working of ballistic galvanometer.  
(b) What is damping in ballistic galvanometer?
31. (a) Discuss in details the torque acting on a magnetic dipole.  
(b) What is magnetic hysteresis? How is it useful in choosing materials for permanent magnet?
32. Derive Maxwell's equation with the cases in vacuum and medium.

