

**Note:** Section I is compulsory. Attempt any three (3) questions from Section II.

### SECTION – I

**2. Write short answers to any EIGHT questions.**

(2 × 8 = 16)

- Suppose you follow an electric field line due to a positive point charge. Do electric field and the potential increase or decrease.
- Describe the force or forces on a positive point charge when placed between parallel plates.
  - with similar and equal charges
  - with opposite and equal charges
- State Gauss's Law. Write down its mathematical form.
- Define dielectric constant. Give its mathematical form.
- Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.
- Why the voltmeter should have a very high resistance.
- A sensitive galvanometer cannot be stable. Why?
- What should be the orientation of current carrying coil in a magnetic field so that torque acting on it is
  - maximum
  - minimum
- If a nucleus has a half life of 1 year, does this mean that it will be completely decayed after 2 years? Explain.
- What fraction of a radioactive sample decays after two half lives have elapsed?
- What are baryons and mesons? How are they formed?
- Describe principle and working of Mass Spectrograph.

**3. Write short answers to any EIGHT questions.**

(2 × 8 = 16)

- Describe a circuit which will give continuously varying potential.
- Explain why the terminal potential difference of a battery decreases when the current drawn from it is increased.
- Distinguish between resistance and resistivity. Give units.
- How does doubling the frequency effect the resistance of an (a) Inductor (b) Capacitor
- What is meant by A.M and F.M?
- Give four characteristics of series resonance circuit.
- What are Para and ferromagnetic substances? Give example.
- What is meant by Hysteresis loss? How is it used in the construction of a transformer?
- What are applications of Superconductors?
- Why ordinary silicon diodes do not emit light?
- Why a photodiode is operated in reverse biased state?
- What are the characteristics of operation amplifier?

**4. Write short answers to any SIX questions.**

(2 × 6 = 12)

- Does the induced emf always act to decrease the magnetic flux through a circuit?
- How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop?
- How the "Eddy Currents" are produced? What are their effects on the efficiency of a transformer?
- As a solid is heated and begins to glow, why does it first appear red?

(Turn Over)

- v. Can pair production take place in vacuum? Explain.
- vi. Find the relativistic mass of an object moving with speed  $0.8C$ , where 'C' is the speed of light.
- vii. Write down at least four applications of a photocell.
- viii. What are the advantages of laser over ordinary light?
- ix. Write down any two postulates of Bohr's theory of Hydrogen atom.

## SECTION – II

- 5. (a) Find the charge on an electron by Millikan's method. (5)  
(b) A rectangular bar of iron is 2.0cm by 2.0cm in cross-section and 40cm long. Calculate the resistance, if the resistivity of iron is  $11 \times 10^{-8} \Omega m$  (3)
- 6. (a) Discuss the principle, construction and working of a Galvanometer. (5)  
(b) A square coil of side 16cm has 200 turns and rotates in a uniform magnetic field of magnitude 0.05T. If the peak emf is 12V, what is the angular velocity of the coil? (3)
- 7. (a) Discuss the flow of A.C. through a capacitor. Explain phase relationship between current and voltage graphically and also vectorially. (5)  
(b) The current flowing into the base of a transistor is  $100 \mu A$ . Find its collector current  $I_C$ , its emitter current  $I_E$  and the ratio  $I_C/I_E$  if the value of current gain  $\beta$  is 100. (3)
- 8. (a) Define strain energy. Derive its relation for an elastically deformed wire in terms of modulus of elasticity. (5)  
(b) What is the de-Broglie wavelength of an electron whose Kinetic Energy is 120eV? (3)
- 9. (a) Explain the phenomenon of nuclear transmutation or radioactive decay. (5)  
(b) The wavelength of K x-ray from copper is  $1.377 \times 10^{-10} m$ . What is the energy difference between the two levels from which transition results? (3)