

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

SECTION – I

2. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- i. The potential is constant throughout a given region of space. Is the electrical field zero or non-zero in this region?
- ii. Describe the force or forces on a positive charged particle when placed between two parallel plates with similar and equal charges.
- iii. Distinguish between conductor and photo-conductor.
- iv. How does a capacitor work in an electrical circuit?
- v. If a charged particle moves in a straight line through some region of space, can you say that the magnetic field in the region is zero?
- vi. A loop of wire is suspended between the poles of a magnet with its plane parallel to the pole faces. What happens if a direct current is put through the coil? What happens if an alternating current is used instead?
- vii. How does the beam of electrons is focused and deflected in CRO?
- viii. Differentiate between stable and sensitive galvanometer.
- ix. Write down two interactions of matter with energy.
- x. If you swallowed an alpha-particle source and β - source which would be the more dangerous to you? Explain.
- xi. Explain the working of control rods in nuclear reactor.
- xii. For what purpose alcohol or bromine is mixed with principal gas in GM-tube?

3. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- i. Describe a circuit which will give continuously varying potential.
- ii. How does doubling the frequency affect the reactance of capacitor?
- iii. What is para substance? Give example.
- iv. Why ordinary silicon diodes do not emit light?
- v. Why photodiode is operated in reverse biased state?
- vi. Explain the conditions under which electromagnetic waves are produced from the source?
- vii. Define the term (i) Elastic limit (ii) Ultimate tensile stress from stress strain curve.
- viii. Explain why the terminal potential difference of battery decreases when current drawn from it, is increased?
- ix. What do you mean by tolerance with reference to carbon resistor?
- x. What is power factor in A.C. circuit? Explain.
- xi. Energy dissipated per cycle is more for steel as compared to iron. Why?
- xii. Give two characteristics of op-amplifier.

4. Write short answers to any SIX questions.

(2 x 6 = 12)

- i. Does the induced emf in a circuit depends on the resistance of the circuit?
- ii. Show that ϵ and $\frac{\Delta\phi}{\Delta t}$ have the same unit.
- iii. Can a step-up transformer increase the power level?
- iv. What do you understand by work function?

(Turn Over)

- v. As a solid is heated and begins to glow, why does it first appear red?
- vi. Which photon, red, green or blue carries the most (a) energy and (b) momentum?
- vii. When light shines on a surface, is momentum transferred to the metal surface?
- viii. What is meant by line spectrum? Explain line spectrum can be used for the identification of element.
- ix. Can the electron in the ground state of hydrogen absorb a photon of energy 13.6 eV and greater than 13.6 eV?

SECTION - II

Note: Attempt any three (3) questions.

5. (a) Define absolute P.E and derive expression of absolute potential due to a point charge. (5)
- (b) Resistance of an iron wire at 0°C is 1×10^4 ohm. What is the resistance at 500°C if temperature co-efficient of resistance of iron is $5.2 \times 10^{-3} \text{ K}^{-1}$. (3)
6. (a) Derive an expression for torque on current carrying coil in uniform magnetic field. (5)
- (b) The back emf in a motor is 120V when the motor is turning at 1680 rev/min. What is the back emf when the motor turns 3360 rev/min? (3)
7. (a) What is operational amplifier? How does it work as inverting amplifier and also find its gain? (5)
- (b) Find the value of current and inductive reactance when A.C. voltage of 220 V at 50 Hz is passed through an inductor of 10 H. (3)
8. (a) Define intrinsic and extrinsic semiconductor. How N-type and P-type substances are formed? (5)
- (b) What is the maximum wavelength of the two photons produced when a positron annihilates an electron? The rest mass energy of each particle is 0.51 MeV. (3)
9. (a) Write Bohr's second postulate and find out formula for Bohr quantized radii. (5)
- (b) Find the mass defect and binding energy of the deuteron nucleus. The experimental mass of deuteron is $3.3435 \times 10^{-27} \text{ kg}$. (3)