

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

SECTION - I

(2 x 8 = 16)

2. Write short answers to any EIGHT questions.

- Define electron volt (ev). Show that $1 \text{ ev} = 1.6 \times 10^{-19} \text{ J}$.
- Show that $\frac{1 \text{ volt}}{1 \text{ meter}} = \frac{1 \text{ newton}}{1 \text{ coulomb}}$.
- Is $\vec{E}$ necessarily zero inside a charged rubber balloon, if balloon is spherical? Assume that charge is uniformly distributed over the surface.
- Prove that $\text{ohm} \times \text{farad} = \text{second}$.
- How can a galvanometer is made more sensitive? Explain briefly.
- Suppose that a charge q is moving in a uniform magnetic field with a velocity v . Why is there no work done by magnetic force that acts on charge q ?
- Draw a circuit diagram of current measuring part of a voltmeter.
- Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.
- What do you understand by background radiations? State any two sources of radiation.
- How can radioactivity help in the treatment of cancer?
- Differentiate between mass defect and binding energy.
- Define nuclear fission and nuclear fusion.

(2 x 8 = 16)

3. Write short answers to any EIGHT questions.

- Describe a circuit which will give a continuously varying potential.
- A wire of length 10 m has resistance 100 Ω . If the wire is stretched to increase its length three times. What will be its new resistance?
- What is meant by an electromotive force (emf)? Give its unit.
- Explain the condition under which electromagnetic waves are produced from a source.
- What is meant by phase difference?
- Write four properties of parallel resonance circuit.
- Differentiate between paramagnetic and ferromagnetic substances.
- Define modulus of elasticity. Write down its three kinds.
- Why a photo diode is operated in reverse biased state?
- Distinguish between soft magnetic material and hard magnetic material.
- What is solar cell? Give its uses.
- Draw the symbol of pnp and npn transistors six parts.

(2 x 6 = 12)

4. Write short answers to any SIX questions.

- Does the induced emf always act to decrease the magnetic flux through a circuit?
- Can a D.C motor be turned into a D.C generator? What changes are required to be done?
- How fluctuations of the output can be reduced in D.C generator?
- What is meant by efficiency of transformer? Write few steps to improve the efficiency.
- Which has the lower energy quanta? Radio waves or x-rays.
- Why don't we observe a Compton effect with visible light?
- Find the mass m of a moving object with speed 0.8 c.
- Find the speed of electron in the first Bohr orbit.
- Is energy conserved when an atom emits a photon of light?

SECTION - II

Note: Attempt any THREE (3) questions from Section II.

- (a) Define electric potential. Derive the relation of an electric potential at a point due to point charge. (5)

(b) A platinum wire has resistance of 10 ohm at 0°C and 20 ohm at 273°C . Find the value of temperature co-efficient of resistance of platinum. (3)
- (a) What is transformer? How does it work? Explain its use in transmission of electric load to long distances. (5)

(b) What current should pass through a solenoid that is 0.5 m long with 10,000 turns of Copper wire so that it will have a magnetic field of 0.4 T? (3)
- (a) What is comparator circuit? How can it be used as a night switch? (5)

(b) A 10 mH, 20 Ω coil is connected across 240 v and $\frac{180}{\pi}$ Hz source. How much power does it dissipate? (3)
- (a) What is meant by strain energy? How can it be determined from the force extension graph? (5)

(b) Assuming you radiate as does a black body at your body temperature about 37°C , at what wavelength do you emit the most energy? (3)
- (a) What is LASER? Describe its working, population inversion and laser action. (5)

(b) Find the mass defect and the binding energy for tritium, if the atomic mass of tritium is 3.016049 u. (3)