

17210

11718

2 Hours / 50 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Attempt all questions including Question No. 1 which is compulsory.
 - (3) Answer each next main Question on a new page.
 - (4) Illustrate your answers with neat sketches wherever necessary.
 - (5) Figures to the right indicate full marks.
 - (6) Assume suitable data, if necessary.
 - (7) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (8) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any NINE :

18

- (a) Define electric current and state its S.I. unit.
- (b) State and explain Ohm's law.
- (c) Define potential gradient. State its S.I. unit.
- (d) When a charge of $0.08 \mu\text{C}$ is given to a capacitor, its potential is raised to 200 volts. Find its capacitance.
- (e) Define the terms-Dopant, Extrinsic semiconductor.
- (f) Draw energy band diagrams for conductors and semiconductors.
- (g) An X-ray tube is operated at 40 kV. Calculate the minimum wavelength of X-rays emitted by it.

- (h) State any two applications of LDR.
- (i) Which property of lasers enables the medical practitioners to use them for performing cataract operations ? Explain.
- (j) Define :
 - (i) Optical pumping
 - (ii) Population Inversion
- (k) What is Nanotechnology ? Define Nano-scale.
- (l) Mention Nano-material of one dimension and two dimensions.

2. Attempt any FOUR :

16

- (a) Calculate the resistance & conductance of 2 m length of wire having diameter 0.4 mm and specific resistance $0.45 \times 10^{-6} \Omega\text{-m}$.
- (b) State and explain the balancing condition of Wheatstone's network.
- (c) Derive an expression for the capacitance of a parallel plate capacitor. State the factors on which it depends.
- (d) Three condensers with capacity $6 \mu\text{F}$, $10 \mu\text{F}$ and $14 \mu\text{F}$ are connected in parallel in a circuit & a P.D. of 220 volts is applied across the combination. Calculate the charge on each capacitor & also the total charge across the combination.
- (e) Distinguish between P-type and N-type semiconductors. (Any four points)
- (f) Explain the construction and working of a photoelectric cell with a neat diagram.

3. Attempt any FOUR :**16**

- (a) State any four characteristics of photoelectric effect.
- (b) The threshold wavelength of silver is 3800 Å. Calculate the maximum energy of photoelectrons emitted in eV if ultraviolet light of wavelength 2600 Å is incident on it.

(Planck's constant $h = 6.625 \times 10^{-34}$ J-sec; Speed of light $C = 3 \times 10^8$ m/sec)

- (c) Explain the forward bias characteristics of a P-N Junction diode.
 - (d) State any four applications of X-Rays.
 - (e) Explain in detail the construction & working of He-Ne laser.
 - (f) State any four applications of nano-materials in the field of engineering.
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