

17210

11920

2 Hours / 50 Marks

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any NINE of the following:

18

- a) Define electric current and its SI unit.
- b) Draw labeled diagram of Wheatstone's network.
- c) Define potential gradient and its unit.
- d) A capacitor of capacitance $5\mu\text{f}$ is connected to a supply of 5V. Calculate the charge on the capacitor.
- e) Draw energy band diagram for insulator.
- f) Draw the symbol of LDR and state its working principle.
- g) State planck's quantum hypothesis.
- h) State any two medical applications of x-rays.
- i) Define optical pumping and population inversion.
- j) Draw labeled diagram of He-Ne laser.
- k) State two properties of nano material.
- l) What are carbon nanotubes?

P.T.O.

2. Attempt any FOUR of the following:**16**

- a) The specific resistance of material of a wire is $3.2 \times 10^{-7} \Omega \text{m}$. If the resistance is 4Ω and its length is 20m, calculate diameter of a wire.
- b) Derive expression for effective capacitance when three capacitors are connected in parallel combination.
- c) (i) Draw the symbol of photodiode and state the principle on which it works.
(ii) State any two applications of photodiode.
- d) The photoelectric work function of a metal is 5 eV. Calculate threshold frequency and threshold wavelength
 $h = 6.6 \times 10^{-34} \text{ Js}$, $c = 3 \times 10^8 \text{ m/s}$
- e) Explain the production of X-rays using Coolidge tube with a neat labelled diagram.
- f) Plot and explain the I-V characteristics of a p-n junction diode.

3. Attempt any FOUR of the following:**16**

- a) Find minimum wavelength and maximum frequency of the X-rays produced by an X-ray tube operating at 80 KV.
($h = 6.63 \times 10^{-34} \text{ J/sec}$, $c = 3 \times 10^8 \text{ m/s}$, $e = 1.6 \times 10^{-19} \text{ C}$)
 - b) Mention four properties of laser.
 - c) Describe four applications of nano-material in engineering field.
 - d) State any four engineering application of laser.
 - e) State characteristics of photoelectric effect.
 - f) State any four engineering applications of nanotechnology.
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