16172

2 Hours / 50 Marks   Seat No. ☐☐☐☐☐☐☐☐

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) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) 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) State Ohm's law. Give meaning of the symbols used.

(b) State the principle of potentiometer device.

(c) Draw a neat diagram of Wheatstone's Network.

(d) Write the factors on which capacity of parallel plate capacitor depends.

(e) Define One Farad.

(f) Draw a neat labelled diagram showing capacitors connected in parallel combination.

(g) Draw the energy band diagram for conductors and semiconductors.

(h) State the principle of photodiode and draw its symbol.

(i) Draw the circuit diagram of reverse biased PN junction diode.

(j) An accelerated electron emits a quantum of radiation with frequency 8×10^8 Hz. Calculate the energy of electron. Given : h = 6.62×10^{-34} Js.

(k) Give the full form of LASER.

(l) Name one zero dimensional and one dimensional nano material.

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

    (a) The specific resistance of the material of a wire is 2.81×10^{-7} Ωm. If the resistance of the wire is 2.1 Ω and its radius is 0.8 mm, calculate the length of the wire.

    (b)   (i) State the principle of the potentiometer.

        (ii) Define potential gradient :

    (c) Find the area of parallel-plate condenser if its capacitance is 3 μF, distance between the two plates is 0.04 mm, dielectric constant is 6 and $\varepsilon_0 = 8.9 \times 10^{-12}$ SI unit.

    (d) Explain forward biased PN junction diode. Draw its I-V characteristics.

    (e) Differentiate N-type and P-type semiconductor.

    (f) State four applications of LDR.

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

    (a) Draw a neat labelled diagram of photocell and state two properties of photons.

    (b) Explain the production of X-ray's using Coolidge tube.

    (c) State four applications of X-ray's.

    (d) Calculate the minimum wavelength and maximum frequency of X-ray's produced by an X-ray tube working at 40 kV.

    Given : $h = 6.62 \times 10^{-34}$ Js

            $c = 3 \times 10^{8}$ m/s

            $e^{-} = 1.6 \times 10^{-19}$ C

    (e) State the engineering applications of LASER.

    (f) State four applications of nano material in engineering field.

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