

17210

16117

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:
 - (i) electric current
 - (ii) 1Ω
- b) State the principle of potentiometer.
- c) Calculate the potential drop across a potentiometer wire of length 200 cm so as to have potential gradient of 10^{-3} V/m.
- d) The p.d. of 60 volt is applied across a condenser of capacitance $20\mu\text{f}$. Calculate the charge on each plate of the condenser.
- e) Draw neat labelled energy band diagram of semiconductor.

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- f) Explain the p-type semiconductor.
- g) State Planck's quantum hypothesis.
- h) Define:
 - (i) Intrinsic semiconductor
 - (ii) Fermi energy level
- i) State any two engineering applications of X-Rays.
- j) Explain the term "Stimulated Absorption" in lasers.
- k) Classify nanomaterials according to their dimensions.
- l) State any two engineering applications of nanomaterials.

2. Attempt any FOUR of the following:

16

- a) (i) Define resistivity and state its SI unit.
(ii) A metal wire 3m long has a diameter of 0.36 mm. If its resistance is 0.9Ω , Calculate the resistivity of the wire.
- b) State and explain the balancing condition of Wheatstone's network.
- c) Derive the formula for capacitance of parallel plate condenser. State the factors on which it depends.
- d) (i) Draw the symbol of a photodiode and state the principle on which it works.
(ii) State any two applications of photodiode.
- e) When light of wavelength 4000 \AA is incident on metal plate, electrons are emitted with zero velocity. Calculate threshold frequency and photoelectric work function of the metal.
(Given, $h = 6.625 \times 10^{-34} \text{ J-sec}$, $C = 3 \times 10^8 \text{ m/sec}$).
- f) Explain the production of x-rays using Coolidge tube with a neat labelled diagram.

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

- a) Three condensers are connected in series across 220V supply. If the voltage drops across the condensers are 50V, 60V and 110V respectively and the charge on each condenser is $6\mu\text{F}$, calculate the capacitance of each condenser and hence the effective capacitance of the combination.
 - b) Explain the I-V characteristics of a P-N junction diode in detail when it is forward biased and reverse biased.
 - c) With neat labelled diagram, explain the working of photoelectric cell.
 - d) Calculate the minimum wavelength and maximum frequency of X-rays produced by an X-ray tube operating at 50kV. (Given - velocity of light, $c=3\times 10^8$ m/sec).
 - e) With neat labelled diagram, explain the working of He-Ne laser.
 - f) Write the names of any four physical methods of synthesis of nanoparticles.
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