17210

15162

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) 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 <u>NINE</u> of the following:**   **18**

a) State Ohm's law with mathematical equation.

b) A potentiometer wire of length $2\,m$ has a voltage drop of $0.2\,V$ across it. Find potential gradient.

c) Draw a neat diagram of wheatstone's network.

d) A capacitor of capacitance $5\,\mu F$ is connected to a supply of $10\,V$. Calculate the charge on the capacitor.

e) State the values or range of values of energy band gap for conductors, semiconductors and insulators.

f) Draw energy band diagram for semiconductor.

g) Draw the symbol of LDR and state its working principle.

h) Define -
   (i)   Threshold frequency
   (ii) Work function

i) State Einstein's photoelectric equation with the meaning of all the symbols involved.

j) "Lasers are specifically used for cataract operations". Give appropriate reason.

k) State two properties of nanoparticles.

l) What are carbon nanotubes ?

2. **Attempt any <u>FOUR</u> of the following:** **16**

a) Calculate the resistance of wire of length $50\,cm$ and cross-section area of $0.02 \times 10^{-6}\,m^{2.}$ (Given - specific resistance of the wire $= 3.5 \times 10^{-7}\,\Omega$-m)

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

   (ii) Give any two uses of potentiometer.

c) The capacitance of a parallel plate capacitor is with a certain dielectric medium between the plates of the capacitor. Find the capacitance of the capacitor if

   (i) the distance between the two plates is double; and

   (ii) the area of the plates is halved.

d) Three condensers of capacitance $2.2\ \mu F$, $3.6\ \mu F$ and $5.6\ \mu F$ are connected in parallel across $75\,V$ supply. Find equivalent capacitance and the charge flowing through each condenser.

e) Draw the symbol and state the principle of photodiode. State its any two applications.

f) Plot and explain the I-V characteristics of a p-n junction diode.

3. **Attempt any <u>FOUR</u> of the following:** **16**

a) Explain with diagram the working principle of photoelectric cell. Give its two application.

b) Explain the production of X-rays using coolidge tube with a neat labelled diagram.

c) Find the minimum wavelength and maximum frequency of the X-rays produced by an X-ray tube operating at $80\,kV$.

   (Planck's constant, h $= 6.63 \times 10^{-34}$ J-sec; velocity of light, c $= 3 \times 10^{8}$ m/sec; charge of electron, e $= 1.6 \times 10^{-19}$C)

d) Explain with help of neat labelled diagram, the working of He-Ne Laser.

e) State any four engineering applications of laser.

f) State any four applications of nanotechnology in field of engineering.

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