

# 17210

**21819**

**2 Hours / 50 Marks**

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.  
(2) Illustrate your answers with neat sketches wherever necessary.  
(3) Figures to the right indicate full marks.  
(4) Assume suitable data, if necessary.  
(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**
- State Ohm's law with mathematical equation.
  - Calculate the potential drop across a potentiometer wire of length 300 cm so as to have potential gradient of  $10^{-2}$  V/m.
  - A capacitor of capacitance  $5 \mu\text{F}$  is connected to a supply of 10 V. Calculate the charge on the capacitor.
  - Draw a labelled diagram of Whatstone's network.
  - What is doping? Give two examples of dopants used in semiconductors.
  - State the working principle of photodiode.
  - Define:
    - Intrinsic semiconductor
    - Extrinsic semiconductor
  - State any two applications of x-rays in engineering field.

P.T.O.

- i) State Plank's hypothesis.
- j) Define optical pumping and population inversion.
- k) State two properties of nanomaterial's.
- l) Mention nanomaterial's of zero dimension and one dimension.

2. Attempt any FOUR of the following:

16

- a) Calculate the resistance of wire of length 60 cm and cross-sectional area of  $0.03 \times 10^{-6} \text{ m}^2$ . (Given - specific resistance of wire =  $3.5 \times 10^{-7} \Omega\text{m}$ )
- b) In the following wheat stone's networks calculate value of 'X' to balance the network.

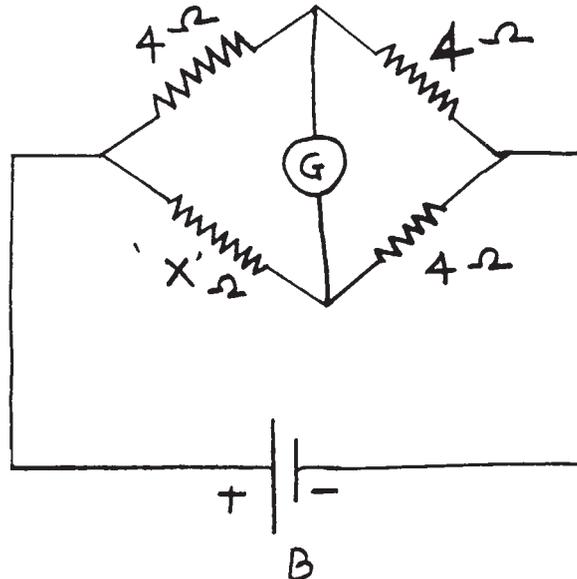


Fig. No. 1

- c) Derive the formula for capacitance of parallel plate condenser and state the factors on which it depends.
- d) Draw the energy band diagram for conductor, semiconductor and insulator. Mention the energy gap of each in eV.
- e) State any four applications of photoelectric cell.
- f) With neat labelled diagram explain the working of He-Ne LASER.

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

- a) (i) Define resistivity.  
(ii) A metal wire of 4 m length has a diameter of 0.48 mm, if its resistance is  $1.2 \Omega$ , calculate the resistivity of the wire.
  - b) Explain working of forward bias P-N junction diode with IV characteristics.
  - c) With neat labelled diagram explain the working of photoelectric cell.
  - d) When a light of wavelength  $3200 \text{ \AA}$  incident on a metal plate, electrons are emitted with zero velocity. Calculate the threshold frequency and work function of the metal.
  - e) State any four applications of X-rays.
  - f) State any four applications of nanotechnology in engineering field.
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