

22217

21718

3 Hours / 70 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 FIVE of the following :

10

- (a) Define the term 'Photoelectric emission'.
- (b) List dielectric materials (any four).
- (c) Define the term 'Permeability'. State its unit.
- (d) Sketch energy band diagram of intrinsic semiconductor.
- (e) List electrical conducting material (any four).
- (f) 'Pentavalent impurity materials are called as Donor impurity.' Justify your answer.
- (g) State working principle of LED.

**2. Attempt any THREE :****12**

- (a) State the effect of following factors on resistivity of electrical conducting material :
  - (i) Temperature
  - (ii) Alloying
  - (iii) Cold work
  - (iv) Age Hardening
- (b) State four selection factors for selecting an insulating material.
- (c) Describe the effect on the capacitance of the dielectric material on the basis of factors polarizability and permittivity.
- (d) Describe Peltier thermoelectric effect. State its application.

**3. Attempt any THREE :****12**

- (a) Compare P-type semiconductor with N-type semiconductor on the basis of
  - (i) Majority charge carrier
  - (ii) Minority charge carrier
  - (iii) Impurity material
  - (iv) Fermi-level position in energy band diagram.
- (b) List specifications of micro relay. (any four)
- (c) Sketch energy band diagram of conducting and insulating material and label it well.
- (d) Sketch orientation of spins in paramagnetic, ferromagnetic, anti-ferromagnetic and ferrimagnetic material.

**4. Attempt any THREE :****12**

- (a) State any two characteristics of
- (i) Electro-textile
  - (ii) Textile-antenna
- used for wearable antenna.
- (b) Describe the concept of ferroelectricity. State its applications.
- (c) Describe with sketch B-H curve. State effect of change in temperature on area of B-H curve.
- (d) State effect of temperature on superconductivity of metals.
- (e) State any **two** properties and application of following material :
- (i) Mica
  - (ii) Transformer oil
  - (iii) Rubber
  - (iv) Polymer

**5. Attempt any TWO :****12**

- (a) The resistivity of pure copper is  $1.56 \mu\Omega\text{-cm}$ . An alloy of copper containing 1 atomic percent nickel has a resistivity of  $2.81 \mu\Omega\text{-cm}$ . An alloy of copper containing 3 atomic percent silver has a resistivity of  $1.98 \mu\Omega\text{-cm}$ . Calculate the resistivity of copper alloy containing 2 atomic percent nickel and 2 atomic percent silver.

**P.T.O.**

- (b) Classify following material as diamagnetic, paramagnetic, ferromagnetic and anti-ferromagnetic :
- (i) Platinum
  - (ii) Iron
  - (iii) Glass
  - (iv) Nickel oxide
  - (v) Quartz
  - (vi) Silicon Iron alloy
- (c) Describe effect of plate area, thickness of dielectric material, permittivity on capacitance of a capacitor.

**6. Attempt any TWO :**

**12**

- (a) Explain thermal conductivity and coefficient of thermal conductivity in semiconductor material.
  - (b) Explain hysteresis loss and eddy current loss of magnetic material.
  - (c) Suggest two passive materials used for substrate, metal and capacitance of semiconductor device fabrication. State their two functions.
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