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22223

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) Enlist factors affecting the resistivity of electrical materials.
 - b) Draw energy level diagram of materials.
 - c) Define dielectric and list any four di-electric materials.
 - d) Draw neat labelled magnetization curve.
 - e) List any two tri-valent and pentavalent impurities.
 - f) Suggest material/impurities used to emit different colours of light in LED.
 - g) Define intrinsic and extrinsic semiconductor.

P.T.O.

- 2. Attempt any THREE of the following:** **12**
- a) Describe modes of emission in metals.
 - b) Describe ferroelectricity and piezoelectricity.
 - c) State the requirement of good insulating material.
 - d) Describe effect of temperature on conductivity of metals.
- 3. Attempt any THREE of the following:** **12**
- a) Describe thermoelectric effect, state its material and application.
 - b) Compare conductor, insulator and semiconductor with following parameter
 - i) Definition
 - ii) Conductivity
 - iii) Energy-band diagram
 - iv) Example
 - c) Sketch orientation of spins in paramagnetic ferromagnetic, anti-ferromagnetic and ferromagnetic material.
 - d) Describe LASER with neat sketch.
- 4. Attempt any THREE of the following:** **12**
- a) State materials used in flexible and wearable antennas.
 - b) Describe the breakdown in solid dielectric material.
 - c) State the effect of following factor on resistivity of electrical conducting material
 - i) Temperature
 - ii) Alloying
 - iii) Cold-work
 - iv) Age hardening
 - d) State any two properties of following material.
 - i) Mica
 - ii) Transformer oil
 - iii) Rubber
 - iv) Polymer
 - e) Explain various factors that affect the permeability.

5. Attempt any TWO of the following:**12**

- a) Compare diamagnetic, paramagnetic, ferromagnetic and anti-ferromagnetic.
- b) The resistivity of pure copper is $1.56 \mu\Omega\text{-cm}$. An alloy of copper containing 1 atomic % nickel has a resistivity of $2.81 \mu\Omega\text{-cm}$. An alloy of copper containing 3 atomic percent silver has resistivity of $1.98 \mu\Omega\text{-cm}$. Calculate the resistivity of copper alloy containing 2 atomic percent nickel and 2 atomic percent silver.
- c) Write one application for following dielectric material.
 - i) Mica
 - ii) Porcelain
 - iii) Polythene
 - iv) Bakelite
 - v) Rubber
 - vi) Cotton

6. Attempt any TWO of the following:**12**

- a) Explain the following in brief
 - i) Diffusion
 - ii) Hall effect
 - iii) Thermal conductivity
 - b) State any four materials used in fabrication of semiconductor devices and describe its need.
 - c) Compare p-type with n-type semiconductor on the basis of
 - i) Majority charged carrier
 - ii) Minority charged carrier
 - iii) Impurity material
 - iv) Fermi-level position in energy band diagram
 - v) Impurity added
 - vi) Example
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