

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0209

Roll No.

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B.Tech.

(SEMESTER IV) THEORY EXAMINATION, 2012-13

ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

Time : 2 Hours]

[Total Marks : 50

SECTION – A

5 × 2 = 10

1. Attempt any **five** parts :

- What is forbidden energy gap ?
- What do you understand by Miller indices of a crystal plane ?
- Define crystal lattice.
- State Seeback effect and Thomson effect.
- Explain the use of isotope effect in super conductors.
- Differentiate between extrinsic and intrinsic semiconductors.
- Explain the temperature dependence of the resistance of a semiconductor.
- Give any two applications of ferrites.
- Draw and explain hysteresis curve.
- State Hall effect.

SECTION – B

2. Attempt any **three** question parts :

3 × 5 = 15

- What are X – rays ? How are they produced ? Discuss their properties.
 - Write short notes on different types of bonds in solids.
- Discuss the effect of temperature and impurity on the conductivity of a metal. Determine the temperature coefficient of resistance of material used in a resistor if the resistance at 25°C is 45 ohm and at 75°C is 59 ohms.



- (c) Derive an expression for the electrical conductivity of a metal on the basis of classical free electron theory.
- (d) Derive the expression for drift and diffusion currents in semiconductor.
- (e) Explain magnetic hysteresis on the basis of domain theory.

SECTION – C

Attempt **all** questions : 5 × 5 = 25

3. Attempt any **one** part : 1 × 5 = 5

- (a) Explain and deduce Bragg's law in X-ray diffraction.
- (b) Describe in short the formation of energy band in solids and hence explain how it helps to classify the materials in to conductors and insulators.

4. Attempt any **one** part : 1 × 5 = 5

- (a) Derive the expression for heat development in a current carrying conductor.
- (b) Explain Josephson effect in superconductors.

5. Attempt any **one** part : 1 × 5 = 5

- (a) Derive Widemann-Frantz law for a conducting material and give its importance.
- (b) What is a P-N junction ? What happens when P-N junction is biased in forward direction ?

6. Attempt any **one** part : 1 × 5 = 5

- (a) Derive the relation between Hall coefficient and carrier density. Assume the presence of only one type of charge carrier.
- (b) Explain the working principle of a FET. Discuss also the advantages of FET over bipolar transistor and vacuum tubes.

7. Attempt any **one** part : 1 × 5 = 5

- (a) Distinguish between dia, para and ferromagnetic materials.
- (b) Explain hard and soft magnetic materials with examples.