

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

PAPER ID : 0209

Roll No.

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B.Tech.

(SEM IV) EVEN SEMESTER THEORY EXAMINATION,
2009-2010

**ELECTRICAL AND ELECTRONICS
ENGINEERING MATERIALS**

Time : 2 Hours

Total Marks : 50

Note : Answer all questions.

1. Answer any four of the following : (4x3=12)

- Explain difference among 'Ionic bonding', 'Covalent bonding' and 'Metallic bonding'.
- What is unit cell ? Discuss four types of unit cells in brief.
- Explain various steps in the determination of Miller indices of a plane.
- Explain Bragg's law. For what purpose it is used ?
- What are various types of crystalline imperfections ? What is meant by screw dislocation ?
- Differentiate conductors, semi conductors and insulators on the basis of band gap.

2. Answer any four of the following : (4×3=12)

- (a) Using classical theory of metals show that the root mean square velocity of the electron is

$$\bar{C} = \sqrt{\frac{3 K_B T}{m}}$$

where K_B = Boltzmann constant,

m = mass of electron in kg

and

T = Temperature k

- (b) Discuss various factors which affect electrical conductivity of metals.
- (c) Derive an expression for heat developed per m^3 per second in a current carrying conductor due to an applied field.
- (d) What is thermoelectric effect? Differentiate among 'seeback effect', 'pettire effect' and 'thomson effect'.
- (e) What are superconductors? List properties of superconductors. Classify superconductors on the basis of (i) kind of material (ii) penetration of magnetic lines of force.
- (f) Enumerate characteristics of high resistivity materials and give their three applications.

3. Answer any two parts of the following : (2×6½=13)

- (a) Explain 'drift' and 'diffusion' phenomena in semiconductors. Derive an expression for total flow of current in a semiconductor and hence deduce Einstein relations.
- (b) Explain construction and working principle of a FET with the help of neat sketch. How does it differ from IGFET?

- (c) List properties of semiconductor materials. Compare Silicon and Germanium from the point of view of their application in semiconductor devices.

4. Answer **any two** parts of the following : (2x6 $\frac{1}{2}$ =13)

- (a) Explain the following :
- Orbital magnetic dipole moment.
 - Electron spin magnetic moment.
 - Nuclear magnetic moment.

The magnetic properties of materials are affected by what type of magnetic moment and why ?

- (b) Differentiate between the following :
- Diamagnetism and paramagnetism.
 - Ferromagnetism and Ferrimagnetism.
 - Neel temperature and Curie temperature.
- (c) (i) Distinguish between soft magnetic material and hard magnetic material.
- (ii) What are ferrites ? Discuss their properties. Name two ferrites and give their one application.

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