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

PAPER ID : 2053 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. IV) THEORY EXAMINATION 2010-11

ELECTRICAL AND ELECTRONICS ENGG.

MATERIALS

Time : 3 Hours *Total Marks : 100*

Note : Attempt **all** questions.

1. Attempt any **four** parts of the following : **(4×5=20)**

   (a) What is forbidden energy gap ? Classify insulators, semiconductors and conductors on the basis of energy band diagram.

   (b) Describe briefly the basic seven crystal systems.

   (c) Explain Bragg's Law. How it can be used to determine the lattice parameters ?

   (d) Discuss briefly :

   (i) Schottky defects and

   (ii) Frenkel defects.

   (e) Explain, space lattice and Atomic packing factor.

   (f) Explain briefly :

   (i) Body centred cubic structure (BCC)

   (ii) Face centred cubic structure (FCC).

2. Attempt any **four** parts of the following : **(4×5=20)**

(a) Explain the different factors which affect the resistivity of conducting materials ?

(b) What is superconductivity ? Discuss the effect of magnetic field on the superconductors.

(c) Derive an expression for heat developed in a current carrying conductor.

(d) Explain Seebeck, Peltier and Thomson effects.

(e) Explain briefly Sommerfeld theory and Zone theory of solids.

(f) A coil of copper wire has a resistance of 50 ohm at 20°C. Calculate its resistance at 60°C. Given the temperature coefficient of resistance at 0°C as 0.00427.

3. Attempt any **two** parts of the following : **(2×10=20)**

(a) What is Hall Effect ? Derive the relation between Hall coefficient and carrier density.

(b) Describe the construction and working principle of FET. How does it differ from IGFET ?

(c) (i) Differentiate between intrinsic and extrinsic semiconductors.

(ii) Discuss in brief the effect of temperature on the conductivity of N-type or P-type materials.

4. Attempt any **two** parts of the following: **(2×10=20)**

(a) Describe hystereris loop of a magnetic material and explain residual magnetism and coercive force.

(b) (i) Differentiate between soft and hard magnetic materials.

(ii) Distinguish between diamagnetism, paramagnetisms and ferromagnetism.

(c) Explain the following :

(i) Relative permealability

(ii) Magnetic susceptibility

(iii) Magnetostriction and

(iv) Magnetic anisotropy.

5. Attempt any **two** parts of the following : **(2×10=20)**

(a) What is dielectric loss and loss angle ? How do the loss factor and dielectric constant vary with temperature and frequency of an alternating field ? Explain.

(b) Describe various mechanisms of dielectric polarisation and derive an expression for electronic polarizability.

(c) (i) A simple parallel plate condenser is to be made to store 10 μc at a potential of 10 kv. The separation between the plates is to be 5×10^{-9} m. Calculate the area that the plates must have if the dielectric material between the plates is of alumina of dielectric constant 10.

(ii) Prove that the internal field due to polarization inside the dielectric is given by :

$$t^{l} = E + \frac{P}{3\xi_{o}}$$