Printed Pages : 3   TEE – 403

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

PAPER ID : 2053   Roll No. ☐☐☐☐☐☐☐☐☐☐

B. Tech.

(SEM. IV) EXAMINATION, 2006-07
ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

Time : 3 Hours]   *[Total Marks : 100*

Note :   *Attempt **all** questions. Each question carries **equal** marks.*

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

   (a)   What is Atomic Packing Factor? Calculate its value for simple cube and body centered cube.

   (b)   Describe in brief the basic seven crystal systems.

   (c)   What is meant by imperfections in a crystal? Explain edge dislocation.

   (d)   Explain briefly the following mechanical properties of metals :

       (i)   Elasticity

       (ii)   Plasticity

       (iii)   Ductility

       (iv)   Malleability

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

   (f)   Draw the (112) and (111) planes in a simple cubic cell.

2   Attempt any **four** parts of the following :   5×4=20
  (a)   Explain superconductivity. Name some of the important superconductivity alloys and elements and give applications in brief.
  (b)   State the following thermo-electric effects
     (i)   Seeback Effect
     (ii)   Peltier Effect and
     (iii)   Thomson Effect
  (c)   Derive an expression for heat development in a current carrying conductor.
  (d)   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.
  (e)   Explain in brief the zone theory of solids.
  (f)   Explain thermal conductivity and obtain an expression for coefficient of thermal conductivity.

3   Attempt any **two** parts of the following :   10×2=20
  (a)   What do you understand by electronic polarization, ionic polarization and orientational polarization of dielectrics? Discuss how electric susceptibility is related to relative permitivity.
  (b)   What is dipolar relaxation? Show that the dipolar relaxation leads to a complex dielectric constant of the material and also deduce an expression.
  (c)   (i)   What are ferroelectric materials? Give their characteristics.
        (ii)   What is piezo-electric effect? Explain the working of a piezo-electric transducer.

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

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

          (ii)   What is a P-N junction? What happens when P-N junction is biased in forward direction.

     (b)   What is Hall Effect? Derive the relation between Hall coefficient and carrier density. Assume the presence of only one type of charge carrier.

     (c)   Explain the working principle of a FET. Discuss also the advantages of FET over bipolar transistor and vacuum tubes.

5   Attempt any **two** of the following :   **10×2=20**

     (a)   Draw a typical hysterisis loop for a ferromagnetic material. Show which part is reversible and which is not. Define residual magnetism and coercive force. How are all these properties explained in terms of the microscopic structure of the solid.

     (b)   (i)   State the factors on which choice of conductor material depends.

          (ii)   Discuss the properties of superconductors. Give their applications.

     (c)   Calculate the loss per kg in a specimen of alloy steel for a maximum flux density of 1.1 Wb/m^2 and a frequency of 50 Hz using 0.5 mm thick sheets. The resistivity of alloy steel is 30×10^{-8} $\Omega\,m$. The density is 7800 kg/m^3. Hysterisic loss in each cycle is 380 W-S/m^3.