Printed Pages – 4 TEE – 403

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

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

B.Tech.

FOURTH SEMESTER EXAMINATION, 2005-2006

ELECTRICAL AND ELECTRONICS ENGINEERING MATERIALS

Time : 3 Hours *Total Marks : 100*

Note : *(i) Attempt ALL questions.*
(ii) All questions carry equal marks.
(iii) In case of numerical problems assume data wherever not provided.
(iv) Be precise in your answer.

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1. Attempt *any four* parts of the following : **(5x4=20)**

(a) What is atomic radius ? Calculate for

(i) Simple cubic structure

(ii) Body centred cubic structure and

(iii) Face centred cubic structure.

(b) Explain in brief :

(i) Unit cell

(ii) Space lattice and

(iii) Co-ordination number

(c) Derive an expression for Bragg's law.

(d) What is Miller Indices ? Explain the procedure for finding Miller Indices.

(e) Explain with diagrams point, line and surface imperfections.

(f) Explain the various electron energy bands in solids. Based on these bands distinguish between insulators conductors and semiconductors.

2. Attempt *any four* parts of the following : (5x4=20)

(a) What is super conductivity ? How it is affected by

(i) frequency

(ii) magnetic field.

(b) Determine the temperature coefficient of resistance of material used in a resistor if the resistance at 25°C is 50 ohms and at 70°C is 57.2 ohms.

(c) Enumerate the characteristics of a good conductor. Discuss the effects of various factors on resistivity of a conductor.

(d) Explain thermoelectric effects and materials suitable for making thermocouples.

(e) Explain in brief the various electron theory of solids.

(f) Derive an expression for heat development in a current carrying coil.

3. Attempt *any two* parts of the following : (10x2=20)

(a) What is polarization in dielectric materials ? Derive the relation $P = \epsilon_0 (\epsilon_r - 1) E$?

(b) Discuss the following :

(i) Electronic polarization

(ii) Ionic polarization

(iii) Orientation polarization.

(c) (i) Explain the phenomenon of piezo electricity

(ii) Define the terms dielectric loss and loss angle of a dielectric ? Deduce expression.

4. Attempt *any two* parts of the following : **(10x2=20)**

(a) (i) Discuss the mechanisms of conduction in N-type and P-type semiconductors.

(ii) Differentiate between intrinsic and extrinsic semiconductors.

(b) Explain the working principle of a FET. What is the difference between FET and BJT ? Explain why a low power FET is called as a square law device.

(c) Explain the Hall effect. Show that the Hall coefficient is inversely proportional to the number of charge carriers density.

The resistivity of semi conductor material was known to be $0.00912\,\Omega$ m at room temperature. The flux density in the Hall model was 0.48 wb/m^2.

Calculate the Hall angle for a Hall coefficient of 3.55×10^{-4} m^3/coloumb.

5. Attempt *any two* parts of the following : **(10x2=20)**

(a) Distinguish between soft and hard magnetic materials. Discuss and explain typical B-H curve for soft magnetic material.

(b) (i) What is magnetostriction ? How many types are possible ?

(ii) What are ferrites ? Give their properties.

(c) (i) State the desirable properties of high resistivity materials.

(ii) Enumerate and describe the general considerations for the selection of materials.

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