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TME-301

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

PAPER ID : 4068

Roll No.

B. Tech.

(SEM. III) EXAMINATION, 2008-09

MATERIAL SCIENCE

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all questions.

1 Answer any **two** of the following : $10 \times 2 = 20$

- What is a dislocation ? What are different kinds of dislocations ? Draw their neat sketches and mark Burger vector in each case. What role does dislocations play in the mechanical properties of metals ?
- Explain the metallic bonding. How does it explain their high electrical and thermal conductivity as well as lusture ?
- List and describe briefly different kinds of X-ray crystallography.

2 Answer any **two** of the following : $10 \times 2 = 20$

- Define the term microstructure. What are different steps involved in the study of microstructure of metals and alloys and what is information obtained from this study ?



(b) Describe the (i) Hardness testing (ii) Impact testing.

(c) Describe the Fe-C diagram with neat sketch and explain its importance.

3 Answer any **two** of the following : $10 \times 2 = 20$

(a) List classification of carbon steels. Describe briefly their properties and typical applications.

(b) Explain the heat treatments : (i) Tempering and (ii) Quench hardening with reference to steel.

(c) What are general characteristics of (i) Ni-Cu alloys known as Monels and (ii) Phosphor bronze ?

4 Answer any **two** of the following : $10 \times 2 = 20$

(a) Define the term magnetic domain. How can you explain the hysteresis loop of ferromagnetic materials on the basis of domains ? What is the cause of the hysteresis ?

(b) Draw logarithm of conductivity versus inverse of absolute temperature plot of an extrinsic (donor doped) semiconductor. Label the various regions and explain them. What information can you get from such a plot ?

(c) What is Meissner Effect ? Draw magnetization (M) vs applied magnetic field (H) for type I and type II superconductors. Sketch magnetic lines of forces around a superconducting material in the presence of magnetic field below and above its superconducting transition temperature. Explain the term critical current density with regard to superconductors.

5 Answer any **four** of the following : $5 \times 4 = 20$

(a) Why porous ceramic bricks are used for insulation in furnaces ?

(b) Why steel reinforcement is given in the concrete buildings ?

(c) Explain the term 'degradation' with regard to polymers.

(d) Describe how are buried water pipe lines are protected from corrosion.

(e) Distinguish between large particles and dispersion strengthened composites.

(f) What is the difference between noble and sacrificial coating on metals ?

(g) Griffith's formula for brittle fracture.

