

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

PAPER ID : 0428

Roll No.

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**B.Tech.**

(SEM. III) THEORY EXAMINATION 2011-12

**MATERIALS SCIENCE IN ENGINEERING**

Time : 3 Hours

Total Marks : 100

**Note** :—Attempt all questions.

1. Attempt any **four** of the following : (4×5=20)
- What is the importance of material in Engineering ?
  - How are atoms bonded in metallic materials ? On the basis of these bondings explain the properties of metals.
  - What are Bravais Lattices and why are they limited to 14 in number ?
  - Find the interplaner spacing of (211) plane for BCC iron having a lattice parameter of 2.866 Å. If a monochromatic radiation of wavelength of 1.542 Å is used, what will be the diffraction angle during X-ray diffraction ?
  - Draw the (1,1, T) plane on a BCT (body centered tetragonal) unit cell. Also show its interaction with (1,1,0) plane.

- (f) Explain how dislocation move during plastic deformation and during creep.

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

- (a) Explain how impact testing of a material is carried out. What information is obtained by impact testing ?
- (b) Explain the phenomenon of creep. Name some alloys that are creep resistant.
- (c) An alloy having 0.3% C and rest iron is observed under the microscope. Draw approximately the micrograph will look like. Also label the various phases present.
- (d) Draw the phase diagram of two metals A and B having complete solid and liquid solubility. The meting point of A is 600°C and that of B is 800°C.
- (e) Explain Gibbs Phase Rule. How is it used ?
- (f) Write down the peritectic and peritectoid reaction. Draw a hypothetical phase diagram of two metals and show a peritectic reaction on that phase diagram. (Draw complete phase diagram)

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

- (a) What are the different types of carbon steels commonly available ? What are the effects of alloying elements on the properties of steel ?

- (b) Explain some of the methods used for case hardening of steel. Also name some application where case hardened steels are used.
- (c) Write the composition, properties and uses of different types of brasses and bronzes.

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

- (a) Explain the domain theory of magnetism. Also explain what is ferromagnetism, antiferromagnetism and ferrimagnetism.
- (b) Differentiate between conductors, semi-conductors and insulators based on the energy band concept. How does the conductivity of semi-conductors increases by doping ?
- (c) What is superconductivity and super conducting transition temperature ? Explain what is 'Messier Effect' shown by super-conducting material. What are its possible uses ?

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

- (a) What are some methods by which processing of ceramic materials is carried out ? What are the applications of ceramic materials ?
- (b) What are the different types of polymerization reactions ? How do they affect the properties of polymers ?
- (c) What are composite materials ? Classify the different types of composite materials.

- (d) What are nanomaterials ? Name some methods by which noncrystalline materials are produced.
- (e) Explain in brief Griffith's Theory of Brittle Fracture.
- (f) Explain the mechanism of fatigue.

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