

(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.

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

(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 melting 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.