

B. Tech Degree IV Semester Examination, April 2010**ME 402 METALLURGY AND MATERIAL SCIENCE***(2002 Scheme)*

Time : 3 Hours

Maximum Marks : 100

- I. (a) What is a metallic bond? How does the type of bonding influences the properties of crystals? Distinguish between a family of planes and family of directions. (7)
- (b) Prove that FCC is closely packed than BCC by calculating atomic packing factor for both. (7)
- (c) Discuss the importance of dislocations. Differentiate between edge and screw dislocation. (6)
- OR**
- II. (a) Explain the process of solidification of metals to form polycrystalline structure. What are the parameters which control the grain size on solidification? (7)
- (b) Substantiate the following statements : (7)
- (i) The electrical conductivity of ionic bonded solids is poor.
- (ii) Crystalline materials exhibit sharp freezing point. (7)
- (c) What is Burgers vector? Draw the burgers circuits for perfect and imperfect crystals and explain. (6)
- III. (a) What are the factors that effect the formation of substitutional and interstitial solid solution? (7)
- (b) Explain the importance of equilibrium diagrams in the development of new alloys. (7)
- (c) Draw Cu-Ni phase diagram and indicate the phases, temperatures and compositions. (6)
- OR**
- IV. (a) Draw and label various areas of an isomorphous system (phase diagram) in which two metals are completely soluble in solid as well as in liquid state. (10)
- (b) Explain the application of phase rule with suitable examples. Discuss the eutectoid reaction in steel. (10)
- V. (a) Sketch the TTT diagram of the following and explain their salient points :- (10)
- (i) medium carbon steels (ii) high carbon steel
- (iii) alloy steels
- (b) Why non ferrous metals are not usually considered suitable for heat treatment? How they are heat treated? (10)
- OR**
- (a) Discuss briefly the different techniques of surface hardening of steel and mention their merits. (10)
- (b) Define hardenability. How is it assessed? Describe a method for determining hardenability of steel. (10)
- VII. (a) Show how Griffith's crack theory explains the considerable effects, which the presence of microstructure faults has a stress raisers in a metal in tension. Why is C4 weak in tension but strong in compression. (10)
- (b) Explain how will you proceed to stop a crack just propagated in a metal. Give the reasons to do so, what would be the stress at the crack tip. (10)
- OR**
- VIII. (a) Describe the kind of fracture, which may occur in a propeller shaft of an automobile. (7)
- (b) Explain the type of failure if a tool mark left on the surface of a component in the view of crack initiation and propagation. (7)
- (c) Justify the statement "pure metals can be effectively strengthened only by cold working" (6)
- IX. (a) Discuss the effect of alloying elements on steels. State the materials used for the following :- (7)
- (i) Hack saw blades
- (ii) Permanent magnets (7)
- (b) What are the important casting alloys of aluminium? Give their composition and uses. (7)
- What are the bearing materials? (7)
- (c) Why stainless steels are corrosion resistant? (6)
- OR**
- X. (a) Classify cast iron and indicate their microstructures and their applications. (7)
- (b) What are the materials used for medical services and explain? (6)
- (c) What are the properties of pure copper. Write a note on high alloy steels. (7)

