B. Tech Degree IV Semester Examination, April 2008

ME 402 METALLURGY AND MATERIAL SCIENCE

(Common for 1999 and 2002 Schemes)

Time : 3 Hours Maximum Marks : 100

I. List and explain various crystal imperfections and show how they can be used advantageously. (20)

OR

II. (a) Explain homogeneous and heterogeneous nucleation. (6)

(b) What is a metallic bond? How does the type of bonding influence the properties of crystals. Distinguish between family of planes and family of directions. (8)

(c) Explain Frank-Read Source with neat sketches. (6)

III. (a) State Hume Rothery rules for substitutional solid solution. (10)

(b) Draw and explain the various areas of an isomorphous system (phase diagram) in which two metals are completely soluble in solid as well as in liquid state. (10)

OR

IV. (a) Explain the iron-carbon equilibrium diagram with neat microstructure figures. Describe the engineering significance of an eutectic point in phase diagram. (10)

(b) What is cooling curve? With the help of appropriate diagram explain the cooling curve for (i) pure metal (ii) Binary solid solution (iii) Binary eutectic system. (10)

V (a) Write short notes on :

(i) Martempering (ii) Austempering

(iii) Case hardening (iv) Electroplating (10)

(b) Draw and explain the TTT diagram of carbon steel of 0.8% carbon. (10)

OR

VI. (a) Explain the various types of annealing. (10)

(b) Write short notes on :

(i) Jomini test (ii) Hot dipping (iii) Metal spraying (10)

VII. (a) Explain the Giriffith's theory of fracture. Derive an expression for the stress required to cause a crack to propagate. Explain the phenomena of fatigue. (10)

(b) Explain with sketches the mechanisms of slip and twinning. (10)

OR

VIII. (a) What is creep? Explain the mechanism of creep with neat sketches. (10)

(b) Explain recovery, recrystallization and grain growth with neat sketches. (10)

IX. (a) What are Babbit metals? Give their composition and characteristics. (10)

(b) What are the functions and uses of alloying elements in steel? (10)

OR

X. (a) Discuss the composition properties and uses of

(i) Grey Cast Iron (ii) Malleable C1 (10)

(b) Discuss the alloys of copper and their applications. (10)

***