

B.Tech Degree IV Semester Examination in Marine Engineering May 2012

MRE 403 METALLURGY AND MATERIAL SCIENCE

Time : 3 Hours

Maximum Marks : 100

- I. (a) Define the following: (6)
 (i) Atomic packing factor (ii) Co-ordination number (iii) Interplanar spacing
 (b) What is the densest plane in an FCC crystal? Explain. (4)
 (c) Briefly explain the following: (10)
 (i) Twist and twin boundaries (ii) Equiaxed and columnar grains.
- OR**
- II. (a) Explain the significance of Miller indices. (5)
 (b) Distinguish between Edge and Screw dislocations. (7)
 (c) Briefly explain nucleation and crystal growth. (8)
- III. (a) State phase rule and explain its applications. (5)
 (b) Explain various types of solid solution. (7)
 (c) Explain the phase diagram for an isomorphous system. (8)
- OR**
- IV. (a) What is the Hume – Rothery rules? (5)
 (b) Discuss the formation of intermetallic compounds. (7)
 (c) Differentiate between eutectic and eutectoid reactions. (8)
- V. (a) State the advantages of normalizing over annealing. (5)
 (b) What is tempering? Is it essential after quenching? (5)
 (c) Distinguish between grey and malleable cast iron. (5)
 (d) What are the functions of alloying elements in steel? (5)
- OR**
- VI. (a) Discuss briefly any two case hardening techniques. (5)
 (b) Briefly discuss electroplating and metal cladding. (5)
 (c) What are the properties of commonly used important alloys steels? (5)
 (d) What are the compositions and uses of Cu and Al alloys? (5)
- VII. (a) Explain with reasons why brass is always stronger than copper at room temperature. (5)
 (b) Justify why zinc is less ductile than copper. (5)
 (c) Explain the mechanism of fatigue. (5)
 (d) Briefly discuss ductile – brittle transition. (5)
- OR**
- VIII. (a) Distinguish between hot and cold working. (5)
 (b) Explain work hardening. (5)
 (c) Briefly discuss the mechanism of creep. (5)
 (d) Explain the Griffith's theory of brittle fracture. (5)
- IX. (a) Briefly discuss the hardness and impact test. (10)
 (b) Explain how proper materials are selected for boilers, steam and gas turbines. (10)
- OR**
- X. (a) Explain any two non destructive tests. (10)
 (b) What are the important characteristics of materials used in shipboard applications? (5)
 (c) What are the materials used for propellers and rudders? Discuss their properties. (5)