

## **B. Tech Degree IV Semester Examination in Marine Engineering June 2011**

### **MRE 403 METALLURGY AND MATERIAL SCIENCE**

Time : 3 Hours

Maximum Marks : 100

- I. (a) Explain the following: (12)
- (i) Bravais lattices
  - (ii) Homogeneous nucleation
  - (iii) Polymorphism
  - (iv) Atomic Packing factor
- (b) Sketch a (110) plane in the unit cell of a cubic crystal. Show all the  $\langle 111 \rangle$  directions that lie on this plane, giving the Miller indices of each one of them. (8)

**OR**

- II. (a) Explain point and line imperfections (dislocations) with neat figures. What are the properties of dislocations? (12)
- (b) Explain twist and twin boundaries. (8)
- III. (a) Draw and explain *Fe-C* Equilibrium diagram. (12)
- (b) What is Gibb's phase rule? (8)

**OR**

- IV. (a) Draw and explain the equilibrium diagram for *Pb-Sn*. (10)
- (b) Explain Eutectic, Eutectoid, Peritectic and Peritectoid reactions with examples. (10)
- V. (a) Explain: (12)
- (i) Annealing
  - (ii) Hardenability of steels
  - (iii) Cyaniding
  - (iv) Metal cladding
- (b) Explain Jominy test. (8)

**OR**

- VI. Explain: (20)
- (i) T - T - T Diagram
  - (ii) Austempering
  - (iii) Martempering
  - (iv) Nitriding
  - (v) Normalizing

- VII. (a) Differentiate hot working and cold working with suitable examples. (10)
- (b) Discuss the classification of steels. Explain the functions of alloying elements of steels with suitable examples. (10)

**OR**

- VIII. (a) Discuss different strengthening mechanisms. (10)
- (b) Explain elastic, anelastic and visco elastic behaviour of materials. (10)
- IX. (a) Explain any two methods of non-destructive testing. (10)
- (b) What are the applications of ceramics in ship board applications? (10)

**OR**

- X. (a) Explain the basic requirements for materials used in ship building with examples. (12)
- (b) Write a short note on fluorescent test for materials. (8)