

**II B.Tech I Semester(R07) Supplementary Examinations, May/June 2010**  
**METALLURGY AND MATERIAL SCIENCE**  
**(Mechanical Engineering)**

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Show a (111) plane in a unit cell of cubic crystal. Also show all the directions of  $\langle 110 \rangle$  which lie on the plane. Give their miller indices?  
(b) Calculate miller indices if a plane cuts tetragonal crystal in  $3A^0$  on X - axis,  $4A^0$  on Y - axis and  $3A^0$  on Z - axis but the c/a ratio is 1.5. [8+8]
2. Write a short note on:
  - (a) Chemical compounds
  - (b) Interstitial compounds
  - (c) Electron compounds
  - (d) Lave phases. [4+4+4+4]
3. Write a short note on:
  - (a) Lever rule
  - (b) Phase rule
  - (c) Eutectic system
  - (d) Congruent Melting intermediate phase. [4+4+4+4]
4. Distinguish between malleable Iron and ductile iron in terms of
  - (a) Manufacturing Process
  - (b) Structure
  - (c) Properties
  - (d) Applications. [4+4+4+4]
5. (a) The cooling power of warm oil is more than cold oil. Where as warm water has less cooling power than cold water. Explain why is it so.  
(b) Hypoeutectoid steels are heated above  $A_3$ , while hyper eutectoid steels are heated only above lower critical temperature only during hardening. Why? [6+10]
6. (a) Draw the copper rich portion of Cu-Sn alloy system and explain the various phases that occur in it.  
(b) Discuss any two important phosphor bronzes, indicating their composition, structure, properties and applications. [6+10]
7. (a) Briefly explain few mechanical properties of ceramic materials. Also describe how the strength of the glass can be increased.  
(b) Discuss briefly glass forming. [10+6]
8. (a) What are composite materials? Indicate their characteristics, advantages and limitations compared to other materials.  
(b) Explain, giving examples, the classification of composite material. [8+8]

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