Code No: A109210306 **R09** **Set No. 2**

II B.Tech I Semester Examinations,November 2010
METALLURGY AND MATERIALS SCIENCE
Common to Mechanical Engineering, Mechatronics, Production Engineering, Automobile Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are ceramics? Indicate their main characteristics.
   (b) Discuss briefly classification of ceramic materials. [5+10]
2. (a) What are two kinds of solid materials? Glass is not considered as true solid. Why?
   (b) How is metallic bond similar to both ionic and covalent bond?
   (c) Ionic solids are bad conductors of electricity but an aqueous or fused solution of them conducts electricity. Why? [4+6+5]
3. (a) What is the difference between phase diagram and equilibrium diagram? Iron-Cementite diagram is a phase diagaram not a equilibrium diagram. Why?
   (b) What is phase rule? What is the difference between Lever rule and Phase rule for a metal system? [7+8]
4. (a) Give the typical composition of white cast iron?
   (b) Explain the malleabilizing treatment given to white cast Iron with a neat sketch?
   (c) Explain the composition, microstructure and properties of gray cast Iron? [2+6+7]
5. (a) What is a nano-composite? Indicate the difficulties of nano-composites.
   (b) Discuss particulate reinforced composites. [5+10]
6. (a) Explain briefly 'AAA' classification of wrought aluminium alloys.
   (b) Discuss any two important aluminium alloys, giving its composition, heat treatment, structure and properties. [5+10]
7. (a) What are intermediate phases? Discuss various types of intermediate phases?
   (b) What is the importance of ratio of radius of interstitial to solvent atom in interstitial compounds? [7+8]
8. (a) What is cold stabilization? Why is it adopted?
   (b) Draw a T-T-T diagram for 0.4% C steel and identify the microstructural phases and their hardness values. What is its relation to C.C.T. diagram? Why is it so difficult to determine the C.C.T. diagram? [5+10]

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Code No: A109210306 **R09** **Set No. 4**

II B.Tech I Semester Examinations,November 2010
METALLURGY AND MATERIALS SCIENCE
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Distinguish between hardness and hardenability.
   (b) Critically discuss Pack carburizing of steels. [5+10]
2. Write a short note on:
   (a) Lever rule
   (b) Phase rule
   (c) Eutectic system
   (d) Congruent Melting intermediate phase. [4+4+4+3]
3. (a) Briefly classify ceramic matrix composites and give examples.
   (b) Discuss in detail continuous fiber reinforced ceramic matrix composites.[5+10]
4. (a) The most commonly used refractory materials is based on Alumina-Silica compositions, with varying range. Justify the statement.
   (b) Describe the structure, properties and applications of Dolomite. [7+8]
5. Write a short note on
   (a) Nucleation and growth
   (b) Micro segregation and macro segregation
   (c) Homogeneous and Heterogeneous nucleation
   (d) Directional solidification. [4+4+4+3]
6. Define solid solution? Discussion in detail with examples of the following:
   (a) Sub situational Solid solution
   (b) Interstitial solid solution. [15]
7. (a) Write in detail about hot working tool steels and cold working tool steels?
   (b) Write in detail about nickel steels? [7+8]
8. (a) Why is alpha Brass more ductile than 60-40 brass?
   (b) What is Gun metal? Indicate its composition and applications.
   (c) What is the significance of Al-Li alloys?

(d) Why is 5 percent tin bronze stronger than 5 percent zinc brass?

(e) What is de-aluminification? How to over come this problem. [3+3+3+3+3]

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Code No: A109210306 **R09** **Set No. 1**

II B.Tech I Semester Examinations,November 2010
METALLURGY AND MATERIALS SCIENCE
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Why stainless steels are stainless?
   (b) Is it possible to harden 18%Cr-8%Ni steels by heat treatment?
   (c) Why Austenitic stainless steels prone to weld decay? How can you avoid weld decay? [2+6+7]
2. (a) What are the important uses of pure copper? Indicate the general relationship between properties and the phase diagram of the copper-zinc system.
   (b) Briefly classify the brasses and give examples. [10+5]
3. Write explanatory notes on the following:
   (a) Piezoelectric ceramis and
   (b) Ferroelectric ceramics. [8+7]
4. (a) What are the attractive package of properties of ceramic materials? Indicate advantages, disadvantages of ceramic matrix composites.
   (b) Discuss any one important ceramic matrix composite. [7+8]
5. (a) If pure Iron is heated to 950^0C and subjected for fast cooling what will be the effect of grain size and why?
   (b) What is the maximum solubility of carbon in iron? Why? What will happen to the carbon if it exceeds the maximum solubility limit? [7+8]
6. There are 3 alloys with the following weight composition

	Element-A	Element-B	Element-C
Alloy^{-1}	70%	20%	10%
Alloy^{-2}	60%	35%	5%
Alloy^{-3}	50%	30%	20%

   In what weight proportion should the above 3 alloys be mixed to produce a new alloy of the following composition. 56% Element-A, 29% Element B, 15% Element C Assume that the total weight is conserved. [15]
7. (a) Carburized components are subjected to subsequent hardening heat treatment. However, nitrided articles will not be heat treated subsequently. Explain why?

(b) What is chemical heat treatment? Explain how it is done? What are the properties of cyamided case? [5+10]

8. (a) Define grain and grain boundary? How does the presence of grain boundary affect the physical and mechanical properties of metals?

(b) What is the effect of heating rate and cooling rate of steel on grain growth and properties of steel?(Consider heating to Austenite zone and cooling from the same zone)? [7+8]

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Code No: A109210306 **R09** **Set No. 3**

II B.Tech I Semester Examinations,November 2010
METALLURGY AND MATERIALS SCIENCE
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Differentiate between a single crystal and polycrystalline material?
   (b) Explain why fine grained materials have superior properties than coarse grained materials?
   (c) Explain the purpose of etching in metallographic examination? [6+5+4]
2. (a) Compare and contrast Brasses with Bronzes.
   (b) What is the role of phosphorous in bronzes? [11+4]
3. What are four basic types of cast Irons? Explain them with respect to properties, microstructure with a diagram and applications? [15]
4. Explain the various methods for drawing phase diagrams? [15]
5. (a) What is the purpose of reinforcements? Describe different types of reinforcements in composites.
   (b) Suggest an appropriate matrix to be used for the following fiber types with proper justification:
      i. SiC,
      ii. Polyethylene
      iii. E-glass. [10+5]
6. (a) What are ceramic materials? Why are they so important?
   (b) Discuss the mechanical behaviour of ceramic materials. [5+10]
7. (a) What is the effect of inadequate time of soaking of steel even at appropriate temperature of hardened steel?
   (b) "Much of the versatility of steel as an engineering material arises from the fact that it is amenable to heat treatment". If so, elucidate this statement with reasons. [4+11]
8. (a) What is the importance of grain size in steel? How do you determine grain size of the given steel?
   (b) Explain why grains are stronger than grain boundaries at high temperature and grain boundaries are stronger than grains at room temperatures? [7+8]

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