

Code No: R22035

R10

SET - 1

II B. Tech II Semester Regular Examinations April/May – 2013

METALLURGY AND MATERIAL SCIENCE

(Com. to ME, AME, MM)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks

1. a) What is meant by grain size? Give the importance of grain size in assessment of the properties of metals?
b) What are the different methods in determining the grain size? Explain any two of them?
2. a) What are the different types of solid solutions? Explain interstitial solid solution with suitable examples.
b) Explain in detail the necessity of alloying with four specific examples.
3. a) What is coring? How it can be eliminated?
b) What is a eutectic reaction with suitable examples?
c) Discuss the importance of equilibrium diagrams.
4. a) State the differences between hypo-eutectoid, eutectoid and hypereutectoid steels.
b) What are the characteristic properties of tool and die steels?
5. What do you mean by TTT diagrams? Describe the method of constructing TTT diagrams for eutectoid steels. Label the various phases in the TTT diagram.
6. a) Draw Al-Cu binary phase diagram. Label all the points and phases in it.
b) Discuss some important Al-Cu alloys.
7. a) What are carbon-carbon composites? How are they produced? Explain.
b) What are important applications of C-C composites? Explain with suitable examples
8. a) Discuss the mechanical and thermal properties of ceramics.
b) Discuss the following types of glasses:
 - i) Pyrex glass
 - ii) Alumina Silicate glass

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Answer any **FIVE** Questions
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1. a) Define the following terms:
i) Metal ii) Crystallization iii) Grain size iv) Composites
b) Explain the covalent bond, ionic and metallic bonds with suitable examples?
2. a) What is a solid solution? Give the classification of solid solutions?
b) Explain the rules for the formation of solid solutions?
3. a) What is an Equilibrium diagram & mention its importance.
b) For an alloy of 0.4% carbon steel draw the cooling curve & microstructure at room temperature
4. Mention the properties, microstructure and applications of the following:
a) White cast iron b) Mild steels c) Tool steels
5. a) Distinguish between annealing and normalising
b) Distinguish between bainite and martensite.
c) Discuss critical cooling rate.
6. a) With the help of a neat sketch discuss briefly copper-tin phase diagram.
b) What are the important tin bronzes and give their properties and applications?
7. Give the composition, properties and uses of the following glasses:
a) Borosilicate glass b) Optical glass c) Soda lime glass.
8. Explain in detail the following:
a) Ceramic matrix composite materials.
b) Metal-Matrix composite materials.

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SET - 3

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Max. Marks: 75

Answer any **FIVE** Questions
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1. Write a short note on the following with examples:
 - a) Chemical compounds
 - b) Interstitial compounds
 - c) Electron compounds

2.
 - a) Give an account on Hume-Rothery classification of metals.
 - b) With a neat sketch, discuss metallic bond and characteristics associated with it.

3.
 - a) Draw a typical Equilibrium diagram for two metals completely soluble both in liquid & solid states. Label the important points, lines and areas in it.
 - b) Explain cooling of any one alloy from the above system.

4. Explain the following:
 - a) Low alloy steels
 - b) Die steels
 - c) Plain carbon steels

5. Draw and explain TTT diagrams for the following:
 - a) Eutectoid steel
 - b) Hypo eutectoid steels
 - c) Hyper eutectoid steels

6.
 - a) Draw the copper-Zinc phase diagram label all the points lines and phases.
 - b) What are the reactions involved in the Cu-Zn phase diagram? Explain.
 - c) Discuss the properties and applications of brasses.

7. Write short notes on the following:
 - a) Nitriding
 - b) Flame and induction hardening

8.
 - a) What are ceramics? Name and explain various types of ceramics.
 - b) Discuss Filament winding of making composite materials.

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SET - 4

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Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks

1. a) Discuss the effect of grain boundaries on the mechanical properties of metals.
b) Write short notes on the electron compounds with suitable examples.
2. a) What is an alloy? How are alloys classified?
b) Discuss substitutional solid solutions with examples.
3. a) Write the Equation of Gibb's phase rule. Define and explain each of the terms in the equation.
b) Calculate the relative amounts of various phases that are present in 0.5% C steel, just above & just below the peritectic temperature.
4. Explain the following:
 - a) Hadfield's manganese steel
 - b) Heat resisting steels
 - c) Maraging steels.
5. a) Explain why Brine solution gives faster cooling than water at the same temperature in heat treatment of steels
b) What are the limitations on the use of Isothermal Transformation diagrams?
6. a) Write a note on alpha-beta brasses. Discuss the some of the important alpha-beta brasses.
b) Discuss the properties and the applications of alpha-beta brasses.
7. a) What are abrasive materials? What are the various types of abrasive materials?
b) Explain the composition, properties and applications of the various types of abrasive materials.
8. Define composite materials? Name some of the composite materials and write their properties and applications.