

**III B.Tech. I Semester Supplementary Examinations, May -2005**  
**HEAT TREATMENT TECHNOLOGY**  
**(Metallurgy & Material Technology)**

**Time: 3 hours**

**Max Marks: 80**

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

\*\*\*\*\*

1. Draw Fe-Fe<sub>3</sub>C phase diagram and label the phase fields. Discuss the different reactions that take place in this system?
2. (a) Explain the differences and limitations of Austempering and martempering.  
(b) Discuss the microstructures and properties of Austempered and martempered steels.
3. With the help of a suitable diagram, explain the principle, process and applications of marstraining and cryo forming?
4. (a) Discuss the heat treatment of Austenitic stainless steels with suitable heat treatment cycle?  
(b) What is sensitisation? Mention the various remedial measures to avoid sensitisation?
5. (a) What are cast irons? Give its importance in the Metallurgical Curriculum?  
(b) Compare and contrast steels and cast Irons.
6. (a) What are ferritic - pearlitic malleable cast irons? Explain.  
(b) What are black heart malleable cast irons? Explain  
(c) What are white heart malleable cast irons? Explain
7. (a) Bring out the various metallurgical properties of copper and its alloys.  
(b) Draw copper-zinc equilibrium diagram. Label various phases in it. Explain the diagram.
8. (a) Explain the importance of Titanium in the modern industrial scenario?  
(b) Explain the various properties of Titanium and its alloys?  
(c) Explain the various applications of Titanium and its alloys?

\*\*\*\*\*

**III B.Tech. I Semester Supplementary Examinations, May -2005**  
**HEAT TREATMENT TECHNOLOGY**  
**(Metallurgy & Material Technology)**

**Time: 3 hours**

**Max Marks: 80**

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

\*\*\*\*\*

1. Draw Fe-Fe<sub>3</sub>C phase diagram and label the phase fields. Discuss the different reactions that take place in this system?
2. Differentiate between:
  - (a) Process annealing and Recrystallization annealing.
  - (b) Spheroidising and Diffusion annealing.
  - (c) Stress relieving and tempering
3. (a) Discuss the effects of various post-carburising heat treatment on the characteristics of case and core of the material.  
(b) Explain the following case hardening methods
  - i. Liquid carburising
  - ii. Gas carburising
4. (a) Discuss the heat treatment of Austenitic stainless steels with suitable heat treatment cycle?  
(b) What is sensitisation? Mention the various remedial measures to avoid sensitisation?
5. Explain the effects of 'P', 'S' and Mn on the properties, Microstructures and applications of cast irons.
6. (a) Explain the microstructure of malleable cast iron and explain its importance?  
(b) What are the properties of malleable cast irons?  
(c) What are the applications of malleable cast irons?
7. Write short notes on the following with respect to composition, properties, Microstructure and applications of
  - (a) Cupronickels
  - (b) Gilding metal
8. (a) What are the main properties of die casting alloys?  
(b) Explain the manufacture of die casting alloys in hot chamber process?  
(c) Explain the various applications of die casting alloys?

\*\*\*\*\*

**III B.Tech. I Semester Supplementary Examinations, May -2005**  
**HEAT TREATMENT TECHNOLOGY**  
**(Metallurgy & Material Technology)**

**Time: 3 hours**

**Max Marks: 80**

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

\*\*\*\*\*

1. Discuss the following statements
  - (a) Martensitic transformation is reversible.
  - (b) Amount of retained austenite is high in high carbon steels and high alloy steels.
  - (c) Martensite transformation does not proceed to completion.
2.
  - (a) Describe the Normalising of steels.
  - (b) Differentiate between normalising and annealing.
3.
  - (a) Explain objectives and uses of surface hardening. Give the classification of surface hardening methods?
  - (b) Discuss any one case hardening method?
4.
  - (a) What is the purpose of alloying? Define alloy steels, give the classification of steels based on carbon content and alloy content.
  - (b) Explain how the alloying elements that dissolve in ferrite increase its strength.
5.
  - (a) With the help of Iron-Iron carbide diagram explain the cooling behavior of Hypo eutectic cast irons with 3% carbon from liquid state to room temperature.
  - (b) Explain the cooling behavior of eutectic cast iron with the help of iron-ironcarbide diagram?
6.
  - (a) What are ferritic - pearlitic malleable cast irons? Explain.
  - (b) What are black heart malleable cast irons? Explain
  - (c) What are white heart malleable cast irons? Explain
7. Write short notes on the following with respect to the composition, properties; microstructures and applications of
  - (a) Cartridge brass
  - (b) Admiralty brass
8.
  - (a) Draw lead-tin equilibrium phase diagram and label all phases in it.
  - (b) Explain the various physical and mechanical properties of lead?
  - (c) What are the important lead alloys. Explain any Two of them in detail.

\*\*\*\*\*

**III B.Tech. I Semester Supplementary Examinations, May -2005**  
**HEAT TREATMENT TECHNOLOGY**  
**(Metallurgy & Material Technology)**

**Time: 3 hours**

**Max Marks: 80**

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

\*\*\*\*\*

1. (a) Explain the term Heat Treatment. How does heat treatment alter the mechanical properties of an alloy?  
(b) Discuss the heat treatment process variables?
2. What is critical diameter? Explain the determination of hardenability of a given steel specimen by Grossman's critical diameter method?
3. (a) What is the significance of post-carburising heat treatment.  
(b) What are the various methods used in general for flame hardening? Explain?
4. (a) Discuss the heat treatment of Austenitic stainless steels with suitable heat treatment cycle?  
(b) What is sensitisation? Mention the various remedial measures to avoid sensitisation?
5. (a) What are cast irons? Give its importance in the Metallurgical Curriculum?  
(b) Compare and contrast steels and cast Irons.
6. (a) Explain the microstructure of malleable cast iron and explain its importance?  
(b) What are the properties of malleable cast irons?  
(c) What are the applications of malleable cast irons?
7. (a) What are of  $\alpha$ -brasses and mention their properties & applications?  
(b) What are  $(\alpha - \beta)$  brasses and mention their properties & applications?
8. (a) Write a short notes on self-lubricating bearings?  
(b) What are dry and anti corrosive bearings? Explain.  
(c) What are solders? Give the various types of solders. Give their applications.

\*\*\*\*\*