

III B.Tech I Semester Examinations, December 2011**IRON PRODUCTION****Metallurgy And Material Technology****Time: 3 hours****Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Describe the procedure for charging a newly lined blast furnace.
(b) Explain Fanning and Back draughting. [7+8]
2. (a) Define sponge iron? Compare sponge iron and pig iron?
(b) Explain the chemistry of direct reduction process.
(c) Critically discuss on applications of sponge iron. [5+5+5]
3. (a) Discuss about the iron ore occurrences in India and in the world.
(b) How are the values of iron ores evaluated? [7+8]
4. (a) Draw the relevant H_2/H_2O verses temperature curves for various iron oxides and discuss them.
(b) What are the advantages of H_2 as a reducing agent?
(c) Compare and contrast direct and indirect reduction of iron ore. [5+5+5]
5. (a) What are the advantages of beneficiation of iron ores?
(b) Describe induration of pellets in a shaft kiln. [7+8]
6. (a) What are the differences between HYL process and SLRN process of sponge iron production?
(b) Describe KRUPP-RENN process. [7+8]
7. How are the following calculated with respect to blast furnace?
 - (a) Useful volume and total volume
 - (b) Bosh and stack angle
 - (c) Useful height and total height
 - (d) Number of tuyers. [15]
8. Write short notes on:
 - (a) Iron making in India
 - (b) Sponge iron making in India. [7+8]

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1. (a) What is sponge iron? What are its other names?
(b) Classify the different sponge iron making processes.
(c) What are the uses and advantages of sponge iron? [5+5+5]
2. What are the factors that are to be considered for the design of a blast furnace? Explain them in detail. [15]
3. (a) Describe plasma smelting process.
(b) What are the merits and demerits of the above process?
(c) Compare plasma smelting process & COREX process. [5+5+5]
4. What are the salient features of physical chemistry of the distribution of elements in the molten metal and slag? [15]
5. (a) List out the principal achievements made in modern blast furnace practice.
(b) Explain the improvements made in the coke.
(c) Explain the advantages and disadvantages of using large capacity blast furnace. [5+5+5]
6. Describe sponge iron production by MIDREX process. [15]
7. (a) Compare and contrast the production mechanism of sinters and pellets.
(b) Explain the advantages and disadvantages of sinter and pellets used in iron making by a blast furnace. [7+8]
8. (a) What is smelt reduction?
(b) Classify the smelt reduction processes.
(c) What are the advantages of smelt reduction process? [5+5+5]

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1. (a) How many types of sponge iron production methods are there? Name them.
(b) Explain production of sponge iron using solid reductant. [7+8]
2. Write short notes on:
 - (a) Sponge production in India
 - (b) Draw backs of Direct Reduction process
 - (c) Advantages of sponge iron. [5+5+5]
3. (a) Define pelletisation? Describe the different water-particle systems.
(b) Compare and contrast disc pelletiser and drum pelletiser. [7+8]
4. Write short notes on:
 - (a) Future of smelting reduction process.
 - (b) Advantages and disadvantages of smelt reduction process. [15]
5. Write short notes on:
 - (a) Paul wurth bell-less system of charging.
 - (b) Scaffolding. [15]
6. (a) Explain RIST diagram.
(b) Explain the reactions in the bosh region of the blast furnace. [7+8]
7. (a) Draw a neat sketch of blast furnace. Label all its parts.
(b) Discuss about the changes in the profile of the blast furnace.
(c) What are the functions of
 - i. Bleeder valve
 - ii. Bustle pipe. [5+5+5]
8. (a) What are the various raw materials used for iron production? Explain their
 - i. Size and Size distribution
 - ii. Composition merits.
(b) What are the various methods adopted in the improvement of quality of ore supplied to blast furnace? [8+7]

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1. Explain the advantages of using the following modern trends in blast furnace operation.
 - (a) High blast temperature
 - (b) Oxygen enrichment of blast.
 - (c) Humidification of blast
 - (d) Injection of fuel through the tuyeres. [15]
2. (a) Describe Dwight-Lloyd machine and the process taking place in it.
(b) What are the advantages of sintering? [7+8]
3. (a) What is metallurgical coke? Explain its important properties.
(b) What are the factors that influence thermal stability of coke? Explain. [7+8]
4. Write short notes on:
 - (a) INRED process
 - (b) Iron making in India. [8+7]
5. (a) Give the classification of sponge iron making process according to reducing agent used, design of the reactor and nature of the charge.
(b) What is the degree of metallization, percentage of reduction and Direct Reduction of Iron?
(c) Discuss about sponge iron as a feed. [5+5+5]
6. (a) Draw the relevant CO/CO_2 verses temperature curves for various iron oxides and discuss them.
(b) Discuss the effect of carbon deposition reaction. [7+8]
7. (a) Why is the blast furnace gas cleaned before use? Explain how the cleaning is done.
(b) Discuss how the air blast is preheated in the stoves before sending into the blast furnace. [7+8]
8. Describe coal based Direct Reduction processes in detail. [15]
