

SUBJECT : IRONMAKING (MT 502)

Full Marks: 70

Time: 3 hrs

Answer Question 1 and any five from the rest.

1. Answer any Five : [2 x 5]
  - a) Give typical compositions of hot metal and slag for an Indian blast furnace
  - b) Why is the melting point of hot metal is much lower than that of iron ?
  - c) How is High Top Pressure applied in a blast furnace?
  - d) Name the substances that can be injected through the tyueres of a blast furnace.
  - e) What is RAFT ? What is its importance?
  - (f) Explain the need for coal injection in blast furnace
  - (g) Mention the coal/coke replacement ratio and coal injection rate achievable in Blast Furnace
2. a) Draw a neat sketch of the blast furnace and show the cohesive zone. State clearly the importance of this zone in blast furnace operation.  
b) State clearly the theoretical conditions for removal of sulphur between iron and slag, indicating the role of carbon. [6+6]
3. a) State briefly how the final blast furnace slag is formed as the initial slag trickles down through the bosh region to the hearth.  
b) Write briefly on the bonds in fluxed sinters and state the benefits of using fluxed sinter instead of hematite ore. [6+6]
4. With sketches, discuss Thermal Reserve Zone, Pinch point and Chemical Reserve Zone [12]
5. a) Distinguish between Sintering and Pelletization.  
b) With a relevant diagram, discuss the reduction of iron oxides, particularly of wustite, by CO gas in presence of CO<sub>2</sub>. Hence explain why 100 per cent indirect reduction is not feasible. [5+7]
- 6 (a). What are the considerations for successful coal injection in Blast furnaces?  
(b). Mention the technologies for reducing the energy consumption in steel plants [6+6]
- 7(a). What are the advantages of use of high performance steels in various applications?  
(b) Outline the various approaches to reduce carbon dioxide emission in life cycle of a steel product [6+6]
- 8 (a). Describe the process flow chart for a steel plant using BF (blast furnace) – BOF (basic oxygen furnace) route  
(b) What are the basic operations involved in pelletisation of iron ore? [6+6]