

**B. E. METALLURGICAL AND MATERIAL ENGINEERING EXAMINATION, 2019**

( 3rd Year, 2nd Semester )

**STEEL MAKING**

Time : Three hours

Full Marks : 100

Answer Question **No. 1** & any **four** from the rest

- |    |  | Marks |
|----|--|-------|
| 1  | <p>'A' &amp; 'B' are two steelmaking companies, with the following data. Company 'A' has a no. of 90 ton electric arc furnace (EAF), ladle furnace (LF) &amp; 3 no. of billet casters with 4 strands each. Company 'B' has a no. of 20 ton coreless induction furnace (IF), LF &amp; 2 no. of billet casters with 3 strands each. The charge mix of EAF is 60% DRI &amp; rest steel scrap and that of IF is 10% DRI &amp; rest steel scrap. Operating days for steel melt shop is 320 for both the companies. The yield of billet caster is 98% for company 'A' and 97% for company 'B'. For both the cases the yield of LF is 99.5%</p> <p>Calculate :</p> <ul style="list-style-type: none"> <li>- Number of EAF &amp; IF for two companies.</li> <li>- Billet production for both the companies and their net sales realisation</li> <li>- Ratio of raw material cost of the two companies</li> </ul> <p>Data Given :</p> <p>Tap to tap time for EAF &amp; IF are 80 min &amp; 111 min respectively<br/>           For company 'A' casting speed is 3.75 m/min &amp; casting time is 60 min.<br/>           For company 'B' casting speed is 3.10 m/min &amp; casting time is 65 min.<br/>           The billet size is 130 mm X 130 mm<br/>           Cost of DRI is Rs. 25,000/ton &amp; that of steel scrap is Rs. 32,000/ton<br/>           Selling price of billet is Rs. 35,000/ton<br/>           Metallic yield of EAF is 90% &amp; that of IF is 88%</p> | 5+5+4 |
| b) | Compare the charging of Burnt Lime with Limestone in Steelmaking Process   | 3     |
| c) | How heat is generated in Induction Furnace for melting of steel scrap  | 3     |
| 2  | Answer to the followings   |       |
| a) | Differentiate between (any five) <ul style="list-style-type: none"> <li>- AC Electric Arc Furnace &amp; DC Electric Arc Furnace</li> <li>- Acid Steelmaking Process &amp; Basic Steelmaking Process</li> <li>- Ingot Casting Process &amp; Continuous Casting Process</li> <li>- Greenfield Expansion &amp; Brownfield Expansion of Steelplant</li> <li>- Pneumatic Process &amp; Slag Transfer Process of Steelmaking</li> <li>- Favourable Conditions for Desulphurisation &amp; Dephosphorisation</li> </ul>  | 3 X 5 |
| b) | State the Advantages & Disadvantages of Bottom Blowing Processes of steelmaking. Name the shielding gas used in OBM Process  | 2+2+1 |

[ Turn over

- 3 Answer to the followings :
- a) Explain the desulphurisation process in Electric Arc Furnace using double slag practice 4
- b) Why generally Wide End Up (WEU) Mould is used for Killed Steel casting? 3
- c) What is Ladle Furnace ? State the uses of it. 3
- d) What is the mould material used for Continuous Casting Process & why? State the role of mould movement in Continuous Casting Process 1+2+2
- e) Name the common electrode material used in Electric Arc Furnace. State the charging procedures adopted in conventional EAF 1+2
- f) Why Mn hump is formed in conventional LD process? 2
- 4 Answer to the followings :
- a) Describe the LDAC process in details covering the following items : 3+4+3+2  
 Converter Description & Special Feature  
 Charging, Melting & Refining  
 Difference between LD & LDAC Process  
 Where from name LDAC comes?
- b) Define Rimming steel. State the solidification mechanism in Rimming Steel ingot. Name the factors for which Segregation defect of casting is increased? 2+3+3
- 5 Answer to the followings :
- a) State the role of Mould powder in Continuous Casting Process 3
- b) Briefly describe the refining process in LD steelmaking 7
- c) What are the drawbacks of Open Hearth process & Bessemer process 2+2
- d) Write short note on refractories and steelmaking slag in acid & basic process of steelmaking 3+3
- 6 Write short notes on the followings (any four) 5 X 4
- a) Raw Materials for Steelmaking
- b) Objectives of Secondary Steelmaking
- c) Vertical type Continuous Casting machine
- d) Oxygen Lancing System in LD Process
- e) Deoxidation in Steelmaking
- f) Twin Bath Steelmaking Process