Ex/Met/PC/B/T/323/2024

BACHELOR OF ENGINEERING IN METALLURGICAL AND MATERIAL ENGINEERING

EXAMINATION, 2024

(3rd Year, 2nd Semester)

STEEL MAKING

Time : Three hours Full Marks : 100

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

		Marks	
1	Answer to the followings :		CO 6
a)	'A' & 'B' are two steelmaking companies, with the following data. Company 'A' has a no. of 90 ton electric arc furnace (EAF), ladle furnace (LF) & 3 no.of billet casters with 4 strands each. Company 'B' has a no. of 20 ton coreless induction fournace (IF), LF & 2 no. of billet casters with 3 strands each. The charge mix of EAF is 60% DRI & rest steel scrap and that of IF is 10% DRI & 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% Calculate : - Number of EAF & IF for two companies. - Billet production for both the companies and their net sales realisation - Ratio of raw material cost of the two companies Data Given : Tap to tap time for EAF & IF are 80 min & 111 min respectively For company 'A' casting speed is 3.75 m/min & casting time is 60 min. For company 'B' casting speed is 3.10 m/min & casting time is 65 min. The billet size is 130 mm X 130 mm Cost of DRI is Rs. 33,000/ton & that of steel scrap is Rs. 35,000/ton Selling price of billet is Rs. 43,000/ton Metallic yield of EAF is 90% & that of IF is 88%	5+5+5	
b)	Deduce how heat is generated in an conventional Electric Arc Furnace	5	
2	Answer to the followings		CO 5
a)	Differentiate between - Vertical -type & S-type Continuous Casting Machine - Continous Casting Process & Ingot Casting Process - Narrow End Up (NEU) mould & Wide End Up (WEU) mould	3 X 4	
b)	State the role of mould powder in continuous casting process with one example.	3	
c)	Briefly describe the solidification mechanism of Killed, Semi-killed & Rimming steel ingot.	5	
3	Answer to the followings :		CO 4
a)	Descibe a Ladle Furnace with a neat diagram	6	
b)	Describe the synthetic slag treatment & injection metallurgy of steel for desulphurisation	5	
c)	Write short note about importance of secondary steelmaking	5	
d)	Differntiate between Diffusion Deoxidation & Precipitation Deoxidation	4	
4	Describe the LDAC process in details covering the following items : Convertor Description & Special Feature Charging, Melting & Refining Difference between LD and LDAC State the advantages and disadvantages of OBM over LD	5+6+5+4	CO 3
5	Describe the following in connction with LD steelmaking - Oxygen lancing system of LD steel makimg - Mutual Compound Acceleration - Waste Gas Treatment - Factors on which rates of dissolution of Scrap & Lime are dependant	5+5+4+6	CO 3
6	Answer to the followings		
a)	Write short note on refractories and steelmaking slag in acid & basic process of steelmaking	3+4	CO 2
b)	Name solid, liquid & gaseous source of heat (one each) as external source in steelmaking	3	CO 2
c)	Briefly describe the refining process in conventional steelmaking	5	CO 1
d)	Compare between Desulphurisation & Dephosphorisation process of steelmaking	5	CO 1