BACHELOR OF ENGINEERING IN METALLURGICAL AND MATERIAL ENGINEERING

EXAMINATION, 2018

(3rd Year, 2nd Semester)

STEEL MAKING

Time : Three hours | Full Marks : 100

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

		Marks
1	In a mini steel plant, production of billet is 2.2 mtpy The plant uses DRI & steel scrap as charge material to steel melting shop (SMS). The producer can install either electric arc furnace (EAF) or coreless induction furnace (IF). The plant has a billet caster & a ladle furnace(LF) other than EAF/IF What should be the size of steel melting & refining units for installing either EAF or IF ? What is the electrical energy consumption for the total steel melt shop (EAF/IF, LF & caster) for each case? What is the number of strands of billet caster, if EAF is the steel melting unit? Data Given : The yield of billet caster is 96% & that of LF is 99.5% For EAF the number of furnace is 6 For IF the number of furnace is 20 The charge mix for EAF or IF is 80% DRI and rest steel scrap. The electical energy consumption for EAF & IF are 585 & 715 kwh/Ton of liquid steel for this charge mix. The electical energy consumption for LF & caster are 35 & 15 kwh/Ton of their respective products. No. of days of operation for steel melt shop (SMS) is 320 Tap to tap time for EAF & IF are 72 min & 120 min respectively Casting speed is 3.12 m/min & casting time is 73 min. The billet size is 130 mm X 130 mm	6+4+4
b)	What are the favouarable conditions of dephosphorisation	3
c)	State the differnces between steelmaking slag with ironmaking slag.	3
2	Answer to the followings	
a)	Differentiate between (any five) - Acid Bessemer Process & Basic Bessemer Process - Vertical -type & S-type Continuous Casting Machine - Diffusion Deoxidation & Precipitation Deoxidation - Narrow End Up (NEU) mould & Wide End Up (WEU) mould - Dry Slag & Wet Slag in Conventional Steelmaking Practice - Pneumatic Process & Slag Transfer Process of Steelmaking	3 X 5
b)	State the role of tundish, rollar apron & withdrawal rolls in continuous casting process.	2+2+1

3	Answer to the followings :	
a)	Describe briefly about the SAB process for desulphurisation in Ladle	3
b)	What are the drawbacks of Open Hearth Furnace operation?	2
c)	To increase EAF temp. which one of the followings is better option & why? - Increase arcing intensity - Oxygen injection	3
d)	State & describe the common quality criteria for lime (to be used in steelmaking)	3
e)	What is arcing in Electric Arc Furnace (EAF)?	4
f)	Write short note on DC EAF	5
4	Answer to the followings :	
a)	Describe the OBM process in details covering the following items : Convertor Description & Special Feature Charging, Melting & Refining Advantages of OBM procees over LD Limitations of the Process	3+4+3+2
b)	Define Killed steel. State the solidification mechanism in Killed Steel ingot. Describe the Pipe formation in Killed Steel ingot along with remedies.	2+3+3
5	Answer to the followings :	
a)	How the metal-slag-gas emulsion is formed in LD convertor	2
b)	State the importance of Mutual Compound Acceleration in LD steelmaking	5
c)	What is the shape of the nozzle for oxygen lancing in LD convertor & why?	2+3
d)	Why KALDO rotor technique is not popular nowadays?	2
e)	Name solid, liquid & gaseous source of heat (one each) as external source in steelmaking	3
f)	What are factors influencing the Injection Ladle Metallurgy for desulphurisation.	3
6	Write short notes on the followings (any four)	5 X 4
a)	LDAC Process	
b)	Factors on which Lay-out of Steel Plant is dependant	
c)	Segregation	
d)	Jet Force Number	