COLLEGE OF ENGINEERING, PUNE-5
Final Year B.Tech
(MT-404 -1) Secondary Steel Making
END SEM EXAM

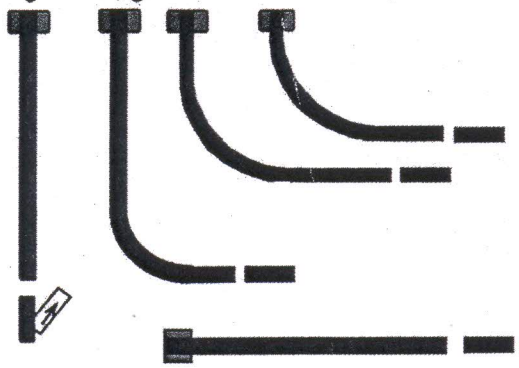
Time: **3 Hours** Max. Marks: **60**

Instructions to candidates:
1) **All** questions are **Compulsory**.
2) Neat Diagrams must be drawn wherever necessary.
3) Assume suitable data, if necessary.
4) Numbers to the right indicate full marks.

Q.1

a) Name at least 5 equipments you are likely to see in a Caster and explain the function of each in detail. (5)

b) In the following sketch, give the names of the casters (2.5)



c) Classify casting machines by the following criteria (2.5)
   i. By Strand
   ii. By Semi finished product
   iii. By mold types

Q.2 a) Commercial production by the Continuous casting route commenced around the year1950, although the concept was known since long before. What was the single most important invention that made this possible? Write a few lines to explain in detail. (2)

b) Define Negative Strip and explain by making a neat sketch. What is the Importance of having Negative Strip? (3)

c) What are the reasons for formation of Longitudinal Cracks? (2)

d) A Caster is casting Low Carbon Steel 220 mm slab at a maximum casting speed of 1.6 m/min. Assume K to be 29. Calculate the Maximum Metallurgical length. (3)

Q.3 a) What are the different origins of nonmetallic inclusions in steel? Explain the process of inclusion modification by treatment of liquid steel with calcium. (5)

b) Briefly explain the possibilities and reactions of Gas absorption during tapping and teeming. What Precautions can be taken to minimise the gas absorption. (5)

Q.4 Consider deoxidation by addition of ferromanganese (60% Mn) to molten steel at 1600^0 C. The initial oxygen content is 0.04 wt.%. It has to be brought down to 0.02 wt.%. Calculate the quantity of the ferromanganese required per one tonne of the steel. The manganese content of the steel before oxidation is 0.1 wt.%. Assume deoxidation product is solid FeO-MnO. (8)

$$Log\ K_{Mn} = \left(\frac{-11070}{T}\right) + 4.536 \quad \text{for (MnO) = [Mn] + [O];}$$

$$Log\ K_{Mn-Fe} = \left(\frac{-6980}{T}\right) + 2.91 \quad \text{for (MnO) + [Fe] = [Mn] + (FeO);}$$

Q.5 Calculate the Optical basicity of slag of composition given below. (8)
MnO = 4 wt%, CaO = 50 wt%, Al2O3 = 35 wt%, SiO2 = 8 wt%, FeO = 3 Wt%. Given the Molecular weights of the oxides as follows: MnO =71, CaO=56, SiO2 = 60, FeO=72, Al_2O_3 = 102.

Q.6

a) What are Ludar Bands? What method can be followed to eliminate this effect? (2)

b) Draw a neat graph showing the temperature changes from furnace to tundish via ladle furnace. (2)

c) "Complex deoxidation results in clean steels compared to simple deoxidation" justify. (1)

Q.7 a) Explain the factors affecting Free open performance of the ladle at the tundish. (2)

b) What is CAS-OB process? Draw a neat sketch explaining the process. (2)

c) Explain the effect of stirring power on inclusion removal with a neat graph. (1)

Q.8

a) Define metallurgical length (1)

b) In case of casting of steel, why is the Metallurgical length so long? Why is it not much less, like 1 meter or so, as is the Case with continuous casting of Aluminum? (1)

c) Define Dwell time (1)

d) Name different desulphurization Methods in Ladle metallurgy. (1)

*** End of the Paper ****