



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(CT)/SEM-5/CT-505/2010-11

2010-11

METALLURGY

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Objective Type Questions)

1. Answer the following questions : 10 × 1 = 10

A) Fill in the blanks :

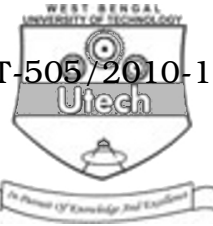
- i) Most of the structural items and merchant products are rolled from ingots, where- as flat products are rolled from ingots.
- ii) In Electric Furnance refining process, Carbon Boil facilitates &
- iii) Production of steel through the conventional blast furnance route requires of which India has limited reserves.



- iv) Sponge Iron is a substitute of for steel making through the secondary route *i.e.* DR/EF route.
- v) The Aluminium oxide is electrolysed in solution in molten
- vi) Shrinkage in foundry casting depends upon and

B) Select the correct alternatives :

- vii) Which of the following does not have an F.C.C. structure ?
 - a) Copper
 - b) Gold
 - c) Aluminium
 - d) α -iron.
- viii) In which of the following alloy systems the two elements are completely insoluble in the solid state ?
 - a) Nickel-Copper
 - b) Lead-Tin
 - c) Bismuth-Cadmium
 - d) Magnesium-Tin.
- ix) Main alloying constituents of Duralumin are
 - a) Ni, Cu, Mg
 - b) Cu, Mn, Mg
 - c) Ni, Mn, Mg
 - d) Cu, Mn, Cr.
- x) Chemical formula of chalcopryrite is
 - a) CuFeS_2
 - b) CuS
 - c) $\text{Cu FeS}_2 \cdot 2\text{H}_2\text{O}$
 - d) $\text{CuO} \cdot \text{Fe}_2\text{O}_3$.



GROUP – B

(Short Answer Type Questions)

Write short note on any *three* of the following. $3 \times 5 = 15$

2. Continuous Casting of Steel.
3. DC Electric Arc Furnace.
4. Allotropic Changes of Iron.
5. Time-Temperature Transformation Diagram.
6. Advantages & Limitations of Powder Metallurgy.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. Distinguish between Killed Steel & Semi-killed Steel. In which case is Shrinkage more & why ? Wheel and Axles are made from fully killed steel & not from rimming steel. Why ? What are the common Ingot defects ? Describe them in short. $3 + 2 + 2 + 2 + 6$
8. How does a slag metal emulsion form in Basic Oxygen Steel making ? How does it account for the fast rate of decarburization in a basic oxygen converter ? Discuss the merits of using magnesia-carbon refractory lining in LD process. What is Slag Splashing ? How is it practised ? What are the merits ? $4 + 2 + 4 + 1 + 2 + 2$
9. a) Draw the Fe-Fe₃C phase diagram, label the various phase fields and discuss in brief the various reactions taking place in the system.
b) Discuss classification of Steel on the basis of
 - i) Application
 - ii) Structure
 - iii) Composition and
 - iv) Amount of alloying elements. $9 + 6$

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10. a) Write what you know about 'Ferrite Stabilisers' and 'Austenite Stabilisers'. Discuss Cast Iron briefly. (6 + 6) + 3
- b) Compute the relative amount of austenite and liquid in cast iron containing 3.5% carbon.
11. What is foaming slag ? How is it formed during Electric Furnace Steel making ? What are its advantages ? Discuss the design consideration of Hearth, Side Wall & Roof of EAF specially mentioning about Refractories. 2 + 3 + 2 + 8
12. Describe with a neat sketch the process flow diagram of Powder Metallurgy. What are the different methods of Powder preparation ? Describe them in short. What are the design considerations for Powder Metallurgy ? 4 + 2 + 7 + 2
13. What are the advantages of using sponge iron in Electric Arc Furnace / Induction Furnace ? How is DRI used for producing Pig Iron ? Describe the process with sketch. How is Sulphur removed from iron ? 4 + 2 + 7 + 2
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