



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech/(CT-NEW)/SEM-6/CT-604/2013

2013

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

(Multiple Choice Type Questions)

1. Answer the following : 10 × 1 = 10
- A. Choose the correct answers for the following :
- i) Factor of safety for brittle material is determined as
 - a) Yield stress/working stress
 - b) Maximum stress/Design stress
 - c) UTS/working stress
 - d) Others.
 - ii) For joining of pipelines for sea shore construction, type of fabrication that is practised is
 - a) rivet joining b) brazing
 - c) butt joining d) welding.
 - iii) Ductile fracture in metal occurs due to
 - a) rapid crack propagation
 - b) extensive plastic deformation
 - c) fracture preceding by moderate amount of necking
 - d) both (b) and (c).



iv) Stress ratio is defined as

a) $\frac{\sigma_{\min}}{\sigma_{\max}}$

b) $\sigma_{\min} - \sigma_{\max}$

c) $\sigma_{\max} + \sigma_{\min} / 2$

d) $\sigma_{\max} / \sigma_{\min}$

v) Some metals exhibit defined fatigue limit due to

- a) metals that exhibit strain aging leading to sharp knee in S-N curve
- b) excessive necking
- c) it is determined experimentally
- d) blocking of dislocations at grain boundaries.

vi) Vicker hardness measurements is determined from

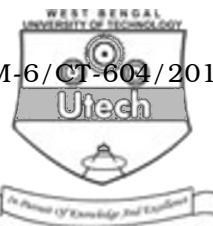
- a) $1.854 P / L^2$
- b) $P / L^2 C$
- c) $P / (\pi D / 2) (D - \sqrt{D^2 - d^2})$
- d) $P / \pi d^2$

vii) Centreline segregation of carbon is usually high in

- a) rimming steel ingots
- b) killed steel ingots
- c) semi-killed ingots
- d) sand casting.

B. Fill in the blanks :

- viii) A metal below carbon in the reactivity series (zinc to silver) may be extracted from its ore by heating with
- ix) Gold and platinum occur in the earth as
- x) Chalcopyrite is an ore of metal.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. Define the term "Brazing" and state its applications.

2 + 3

3. What are the different types of pattern used in casting technology ? State the role and application of some patterns in brief.

2 + 3

4. State a general composition of mould material used in sand mould for metal casting. What are the requisite specifications for a good quality sand mould ?

2 + 3

5. Give a brief account of the basic steps in the Powder Metallurgy Technique.

6. Compare Corex *vs* Blast Furnace process of Iron making.

7. Write short note on any *one* of the following :

- (i) Hydro-metallurgical process of Zinc Extraction
- (ii) Refining of Copper
- (iii) Influence of constituents in steel.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following.

3 × 15 = 45

8. Explain two methods for determining ductility in metal working. Is modulus of elasticity a structure insensitive property ? Explain. Define the terms 'resilience' and 'toughness' of an engineering material.

6 + 2 + 3 $\frac{1}{2}$ + 3 $\frac{1}{2}$



9. Does instability happen at any point during uniaxial testing ? Explain. How Brinell hardness is measured for metal testing ? What are the defects that arise during Brinell hardness ? How Meyer Hardness is measured ? 5 + 5 + 2 + 3
10. How does hardness result vary with temperature ? What is the significance of micro-hardness test ? Explain in brief Knoop indentation measurement. Draw S-N curve for ferrous and non-ferrous metals. 5 + 2 + 4 + 4
11. Discuss the merits of using magnesia-carbon refractory lining on an LD converter. What is slag splashing technology ? How is it practised ? What are its merits ? What do you mean by lime reactivity in LD process ? Which factors influence lime reactivity ? 4 + 2 + 3 + 2 + 2 + 2
12. Distinguish between killed steel and semi-killed steel ? In which case is shrinkage more and why ? What are the common ingot defects ? Explain in brief. How piping can be reduced ? Explain the mechanism. 4 + 2 + 2 + 3 + 2 + 2
13. Draw the C-C-T diagram for eutectoid steel with proper explanations in brief. How is it possible to determine T-T-T diagram ? 8 + 7
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