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 : $10 \times 1 = 10$

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) $1{\cdot}854\ P/L^2$

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. $3 \times 5 = 15$

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. $3 \times 15 = 45$

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