B.TECH. SEM -IV MECHANICAL 2014 COURSE (CBCS) :
SUMMER - 2018
SUBJECT : MATERIAL SCIENCE

Day : **Thursday** Time : **10.00 AM TO 01.00 PM**
Date : **07/06/2018** Max. Marks : 60

S-2018-2303

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Assume suitable data if necessary.

Q.1 **a)** Explain the different factors that affects the recrystallization and Strain Hardening phenomena. **[05]**

b) Define the following terms: **[05]**
i) Co-ordination Number **iii)** Slip plane **v)** Grain boundary
ii) Atomic packing factor **iv)** Twins

OR

a) Find out the number of atoms per mm^2 along the planes (100), (110) in a F.C.C. structure if radius of atom is r = 1.43 ^{0}A. **[05]**

b) Derive the formula to determine critical resolve shear stress? When it is minimum? How? **[05]**

Q.2 **a)** What are different types of load, indenters and scales used in Rockwell Hardness test? List the advantages of this mechanism over other hardness testing mechanism. **[05]**

b) Which NDT methods is suggested for following defects? Why? **[05]**
i) Small invisible cracks on glass plate.
ii) Subsurface crack on Aluminium plate.

OR

a) Explain the creep test in detail. Draw the creep curves for different temperatures and different loads. **[05]**

b) Find the hardness number following information: **[05]**
i) If ball indenter of 2.5 mm diameter is used on aluminium block with 120 kg load obtains circular impression d_1 = 0.95 mm and d_2 = 0.98 mm.
ii) By using square base diamond indenter under 90 kg load on M.S. plate gives square impressions of diagonals d_1 = 0.32 mm and d_2 = 0.36 mm.

Q.3 **a)** Draw the partial eutectic phase diagram and show cooling of Hypoeutectic alloy from high temperature to room temperature with neat sketches. Explain the Gibb's phase rule for those temperatures. **[05]**

b) Write the Hume Rothery rules for complete solid solubility. Give types of solid solutions. **[05]**

OR

P.T.O.

a) Draw the Equilibrium diagram from the following data: [05]
Melting point of A = 730^0C
Eutectic point = 75% B
Melting point of B = 870^0C
Eutectic point temperature = 680^0C
Find the amount of free A in 60% B alloy and also amount of Eutectic by using lever rule.

b) Explain the phenomena of Non-equilibrium cooling. [05]

Q.4 a) Describe the three reactions which occur in Iron-Carbide diagram. Find out amount of phases by using lever rule. [05]

b) Draw microstructure and give properties and uses of the following cast irons: [05]
i) Ferro-Pearlitic gray C.I.
ii) White C.I.
iii) Pearlitic nodular C.I.

OR

a) Classify steels on the basis of carbon content and give it's applications [05]

b) Give the composition and applications of following materials: [05]
i) Pearlitic S.G. Iron **iii)** Wrought Iron
ii) AISI 1010 steel **iv)** Eutectoid steels

Q.5 a) Give chemical composition and application of the following: [05]
i) LM 6 **iii)** Gun metal
ii) Duralumin **iv)** Lead base babbits alloy

b) Discuss in detail precipitation hardening of an aluminium copper alloy. [05]

OR

a) Draw the Cu-Zn equilibrium diagram, explain the different brasses. [05]

b) Explain the different properties of bearing materials. Give it's types and composition. [05]

Q.6 a) Compare between the Wet corrosion and Dry corrosion. [05]

b) Explain the corrosion prevention by CVD technique. [05]

OR

a) Explain the hydrogen Embrittlement as corrosion phenomena. [05]

b) What is meant by PVD process. where it is used? [05]

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