

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, December 2015
B. Tech. in Mechanical Engineering, Semester III

Roll No.....

ME304: Material Science and Engineering

Time: 3.00 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
 2. Assume suitable data wherever required and mention it clearly.
 3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
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Q.1 Objective type (1 marks each)

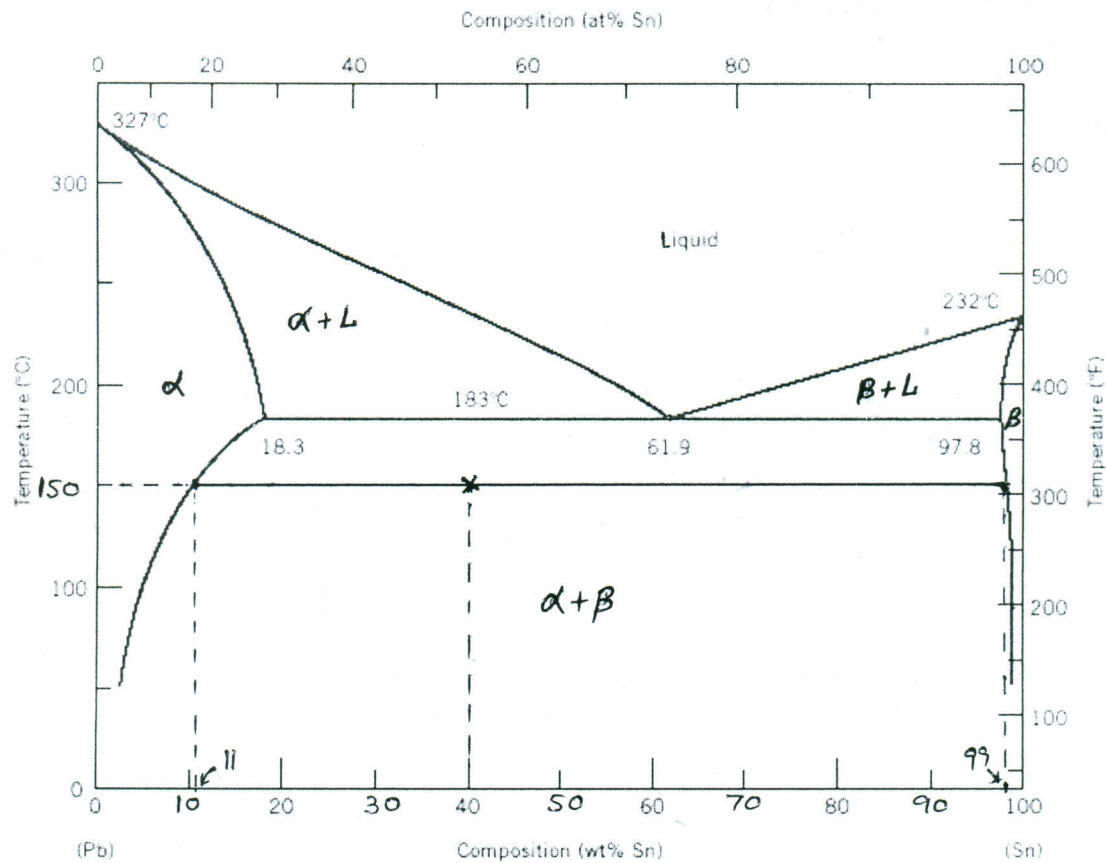
10

- i. The number of atoms per unit cell in case of FCC is
(a) 2 (b) 4 (c) 6 (d) 1
- ii. Write the relation of atomic radius and edge length in case of BCC and FCC.
- iii. Creep curve is a plot of
(a) Strain vs time (b) strain vs temperature (c) stress vs strain (d) elasticity vs temperature
- iv. Which one of the following is the weakest bond
(a) van der Waals bond (b) Covalent bond (c) Metallic bond (d) Ionic bond
- v. Which of the following structure have highest Packing factor
(a) FCC (b) Simple cubic (c) BCC (d) HCP
- vi. What is the effect of Grain size of the metal on the corrosion?
- vii. In edge dislocation, Burgers vector is _____ to the dislocation line.
(Parallel/ Perpendicular).
- viii. In the Phase diagram, the curve above which the alloy is in the liquid state for all compositions is called_____.
- ix. In a one component system, the maximum number of phases that can coexist in equilibrium is
(a) 2 (b) 3 (c) 4 (d) 5
- x. In tensile test, necking start at
(a) Lower yield stress (b) Upper yield stress (c) ultimate tensile stress
(d) just before Fracture

- Q.2 Short answer type questions (2.5 marks each) 10
- Define unit cell with neat diagram and its parameters.
 - Calculate the distance between parallel plane of a crystal which exhibits first order reflection at an angle 30° with X rays of wavelength $2 \times 10^{-10} \text{ m}$.
 - Define Ceramics and give their classification.
 - Define the term defects or imperfection, also name different types of defect.
- Q.3A Define the Burger vector? Explain the Screw dislocation with diagram. 5
- Q.3B What do you mean by Vacancy? Explain the Schottky defect in ionic crystals with diagram. 5
- Q.4A What is Fracture? Give their classification and explain the Fatigue fracture. 5
- Q.4B Draw different types of Unit cell in cubic system? Calculate the atomic packing factor for SCC and FCC structure. 5
- Q.5A Explain the BAUSCHINGER effect with diagram. 5
- Q.5B Copper has FCC Structure and its edge length is $3.61 \text{ \AA}$. Calculate its density. Given atomic weight of copper as 63.5 g/mol , $N_A = 6.023 \times 10^{23}$. 5
- Q.6A Derive the Bragg's equation to calculate the distance between two parallel planes of a crystal. 5
- Q.6B What is a TIE line? Explain the Liver rule through suitable phase diagram. 5
- Q.7A Define the Grain boundaries and Twin Boundary with diagram. 5
- Q.7B What is Solid solution? Explain the Substitutional solid solution with figure. 5
- OR
- Q.7B What are heat treatment and their purpose? Explain the Normalizing treatment. 5
- Q.8 What is Elastic and Plastic deformation? Explain the Slip and Twinning in plastic deformation. 10
- OR
- Q.8 What is corrosion? Give the complete mechanism of Oxidation Corrosion. 10
- Q.9 Write short notes on taking suitable phase diagram 10
- Liquidus and Solidus Line
 - Eutectic point
 - Hypo eutectoid
 - Hyper eutectoid

OR

- 9 Find out the phase present, phase composition and calculate the weight fraction for an alloy composed of 40 wt% Sn - 60 wt% Pb and at 150°C, in the given phase diagram 10



- Q.10 What are the different Phases of Iron? Draw the Iron carbon phase diagram and explain all the salient features of the diagram. 10