

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, 2017 (Backlog)
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.

Q.1 Objective type (1 marks each)

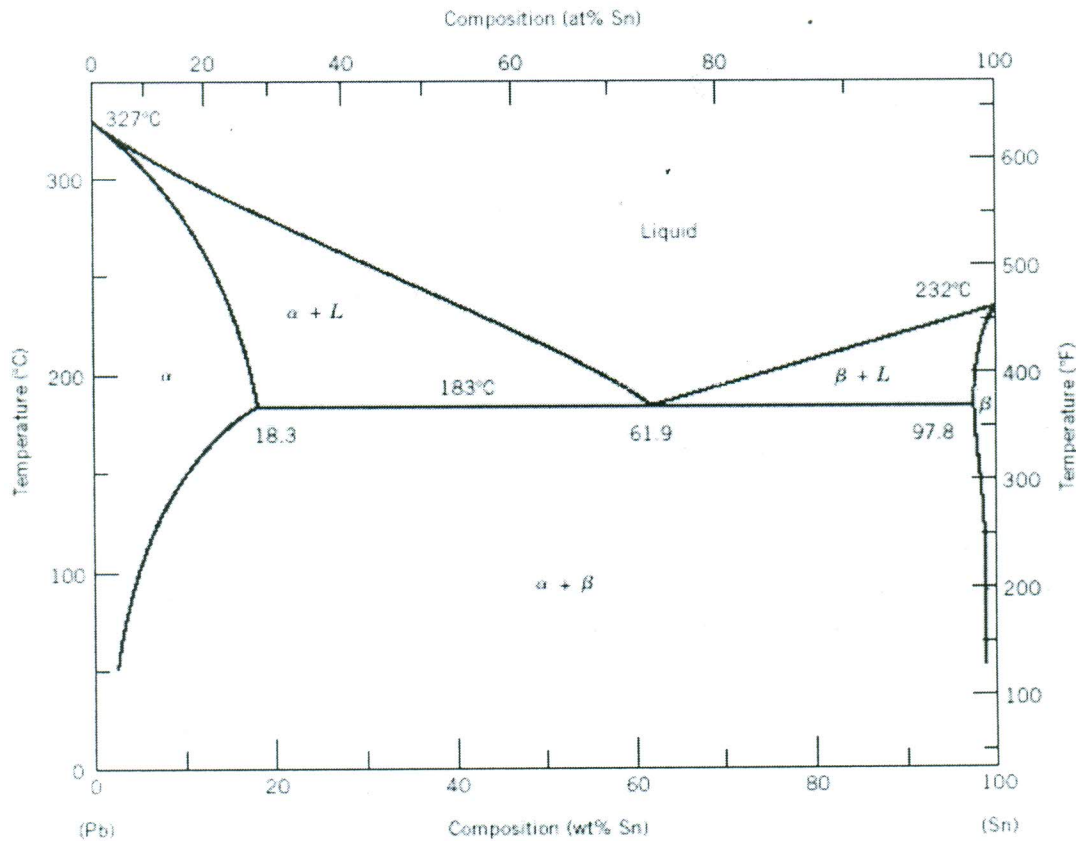
10

- 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. Draw the (111) and (110) plane in cubic system.
- 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. A Tie line is used for finding (choose the correct)
(a) The solubility limit of the solute component of the alloy
(b) Melting point of the alloy
(c) Composition of the alloy in the two phase in equilibrium
(d) Proportion of the two phases in the alloy
- 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.
 - X-ray of wavelength $1.54 \text{ \AA}$ strike at an angle 22.5° on a crystal plane, assuming that $n = 1$, Calculate the spacing between two parallel planes?
 - Define Ceramics and give their classification.
 - Define the term defects or imperfection, also name different types of defect.
- Q.3A What is Fracture? Give their classification and explain the Fatigue fracture. 5
- Q.3B What do you mean by Vacancy? Explain the Schottky defect in ionic crystals with diagram. 5
- Q.4A Define the Burger vector? Explain the Screw dislocation with diagram. 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 Define the Grain boundaries and Twin Boundary with diagram. 5
- Q.5B Copper has an FCC structure and an atom radius of $1.278 \text{ \AA}$. Calculate its density. Given atomic weight of copper as 63.5 g/mol and Avogadro's number as $6.023 \times 10^{23} \text{ atoms/mol}$. 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 Explain the BAUSCHINGER effect 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 are the different Phases of Iron? Draw the Iron carbon phase diagram and explain all the salient features of the diagram. 10
- OR
- Q.8 What is corrosion? Give the complete mechanism of Electrochemical Corrosion. 10
- Q.9 Write short notes on taking suitable phase diagram 10
- Liquidus and Solidus Line
 - Eutectic point
 - Hypo eutectoid
 - Hyper eutectoid

OR

- Q.9 Find out the phase present, phase composition and calculate the weight fraction for an alloy composed of 45 wt% Sn - 55 wt% Pb and at 150°C, in the given phase diagram 10



- Q.10 What is Elastic and Plastic deformation? Explain the Slip and Twinning in plastic deformation. 10