

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, May 2019
B. Tech. in Mechanical Engineering, Semester IV

Roll No.....

ME410: Material Science and Engineering

Time: 3.00 hours

Max. Marks: 80

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)

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- i. In edge dislocation, Burgers vector is _____ to the dislocation line.
(Parallel/ Perpendicular).
- ii. Creep curve is a plot of
 - (a) Strain vs time
 - (b) strain vs temperature
 - (c) stress vs strain
 - (d) elasticity vs temperature
- iii. 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
- iv. Which of the following structure have highest Packing factor?
 - (a) FCC (b) Simple cubic (c) BCC (d) None of them
- v. Draw the (111) and (110) plane in cubic system.
- vi. In the Phase diagram, the curve above which the alloy is in the liquid state for all compositions is called _____.
- vii. In a one component system, the maximum number of phases that can coexist in equilibrium is
 - (a) 2 (b) 3 (c) 4 (d) 5
- viii. Ductility of a metal _____ with decreasing temperature. (decreases/increases)
- ix. Schottky defects normally occur
 - (a) only in ionic crystal (b) in Covalent crystal
 - (c) in non-metallic crystal (d) in metallic and ionic crystals
- x. What is the effect of Grain size of the meatal on the corrosion?

Q.2 Short answer type questions (2.5 marks each)

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- Explain the steps to find out Miller Indices of a plane.
- How the Corrosion take place when two different metals (Cu & Zn) attach to each other and are in contact to a conducting liquid.
- Explain the Tinning and Galvanization for corrosion protection.
- How the Planer and Linear Density is calculated explain?

Q.3A What is Fracture? Give their classification and explain the Fatigue fracture.

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Q.3B Draw a Burger Circuit around the defected plane and explain Burger vector? Explain the Screw dislocation with diagram.

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Q.4A 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 $6.023 \times 10^{23} \text{ atoms/mol}$.

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Q.4B Draw different types of Unit cell in cubic system? Calculate the atomic packing factor for HCP and FCC structure.

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Q.5A Explain the Grain boundaries and Twin Boundary with diagram. How these effect the properties of a metal

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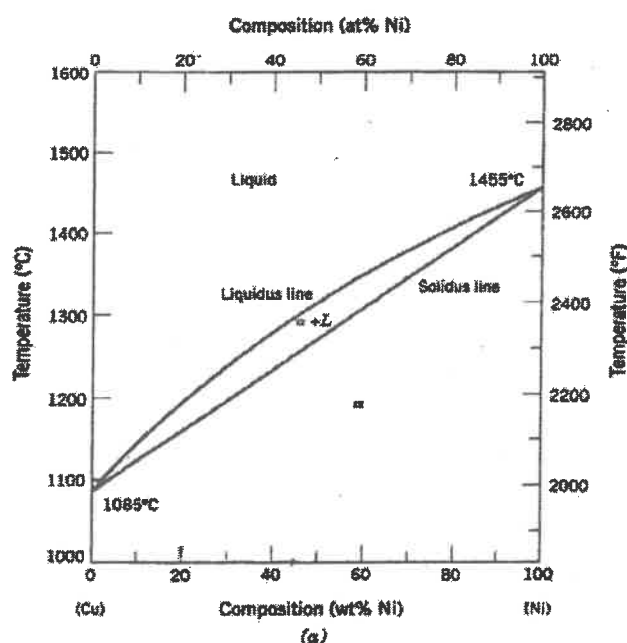
Q.5B Explain the Substitutional solid solution with figure and the condition under which solid solution formed.

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Q.6A Calculate the amount of the phase present, phase composition and calculate the weight fraction a 50 wt.% Ni- 50 wt.% Cu alloy at

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(a) 1400°C (b) 1300°C (c) 1200°C .



Q.6B Write short notes on taking suitable phase diagram

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- (i) Liquidus and Solidus Line
- (ii) Eutectic point
- (iii) Hypo eutectoid
- (iv) Hyper eutectoid

OR

Q.6B What are heat treatment and their purpose? Explain the Normalizing treatment.

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Q.7 What are the different Phases of Iron? Draw the Iron carbon phase diagram and explain all the salient features of the diagram. Explain all the three reaction at different zones.

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OR

Q.7 What is corrosion? Give the complete mechanism of Electrochemical Corrosion.

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Q.8 Find out the phase present, phase composition and calculate the weight fraction for an alloy composed of

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- (i) 45 wt% Sn - 55 wt% Pb and at 150°C,
- (ii) 30wt.% Sn - 70 wt.% Pb alloy at 220°C in the given phase diagram

