PAPER ID-311343

Roll No:

B TECH
(SEM-III) THEORY EXAMINATION 2020-21
MATERIALS ENGINEERING

Time: 3 Hours   *Total Marks: 100*

Note: **1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 10 = 20**

Qno.	Question	Marks	CO
a.	Explain strain hardening mechanism with the aid of dislocation theory.	2	2
b.	Distinguish between Frenkel and Schottky defect.	2	1
c.	Compute the theoretical density of copper with an atomic radius of 1.28Å and an atomic weight of 63.5 g/ mol.	2	3
d.	What is critical resolved shear stress?	2	2
e.	Distinguish between low carbon, medium carbon, and high carbon steels.	2	2
f.	Why solubility of carbon is more in austenite than in ferrite?	2	4
g.	Define hardenability. Mention the factors affecting hardenability.	2	2
h.	What is Lever rule and what is its significance?	2	2
i.	Differentiate between cold working and hot working and their effect on the properties of metals.	2	1
j.	List the classification of copper alloys. Also indicate the principal elements present.	2	3

SECTION B

2.   **Attempt any *three* of the following:**   **3x10=30**

Qno.	Question	Marks	CO
a.	Distinguish brittle and ductile fracture with appropriate examples. Discuss effect of dislocation on strength of material, particularly during deformation.	10	3
b.	In a Lead Tin (Pb-Sn) system the following invariant reaction was observed at a temperature of 183° C α(19% Sn) + β(97% Sn) ->Liquid (62% Sn) . Melting points of Lead and Tin are 327°C and 232°C. (i) Draw the phase diagram. (ii) Calculate the fraction of total α in the alloy containing 80% Sn at 182°C.	10	2
c.	Explain the procedure of constructing a phase diagram in which two metals are soluble in liquid state but fully insoluble in solid state. Also explain the solidification of hypoeutectoid alloy of your choice	10	4
d.	Explain the principle and applications of various heat treatment processes. Discuss changes in microstructure in plain carbon steels during above heat treatment process.	10	4
e.	Distinguish characteristics and applications of brass, bronze and Muntz metal. List the various Nickel alloy steel and explain the utility of Maraging steels in space applications.	10	3

SECTION C

3.   **Attempt any *one* part of the following:**

Qno.	Question	Marks	CO
a.	Explain the phenomenon of screw dislocation with the help of Burger's vector. Explain the mechanism of plastic deformation by slip.	10	2
b.	What are different types of defects in a crystal? Sketch and explain line imperfections of a crystal. Explain effect of dislocation on strength of materials particularly during deformation.	10	2

PAPER ID-311343

Roll No:

4. **Attempt any *one* part of the following:**

Qno.	Question	Marks	CO
a.	Explain Griffith theory of brittle fracture. Distinguish brittle and ductile fracture with appropriate examples.	10	3
b.	The load on a bolt consists of an axial thrust of 8kN, with transverse sheer force of 4 kN. Calculate the diameter of the bolt according to (a) maximum principle shear theory, (b) maximum shear stress theory, and (c) shear energy theory. Take factor of safety to be 3. Given: σ_{yp} = 285 N/mm^2, v= 0.3. Distinguish between destructive and non-destructive tests.	10	4

5. **Attempt any *one* part of the following:**

Qno.	Question	Marks	CO
a.	Two metals A and B are completely soluble in liquid state and partially soluble in solid state. Draw the phase diagram from the data given below. Label the diagram completely. Melting point of A and B are 350° and 230°C Eutectic composition- 40 A – 60B. Eutectic temperature - 180°C Maximum solubility of A in B at Eutectic temperature is 5% and the maximum solubility of B in A at Eutectic temperature is 3% and the solubility at room temperature may be assumed to be zero. Find the chemical composition of phases present at 0 temperature of 200°C and for an alloy containing 30% B along with their relative amounts. Sketch the microstructure of this alloy at room temperature.	10	3
b.	Sketch and describe Iron carbon equilibrium diagram. Show all the salient points on the diagram.	10	3

6. **Attempt any *one* part of the following:**

Qno.	Question	Marks	CO
a.	Sketch the TTT curves for an hypoeutectoid steel, eutectoid steel and hypereutectoid steel. Write the help of this diagram explain different zones of heat treatment in the case of 80% C steel.	10	4
b.	Write short notes on Annealing and Normalizing. Discuss the various surface hardening techniques mentioning their principle, limitation, and specific applications.	10	4

7. **Attempt any *one* part of the following:**

Qno.	Question	Marks	CO
a.	Briefly explain the production of wrought iron in Puddling Furnace. What are the effects of silicon and manganese on the properties of steel?	10	3
b.	Write brief notes on the following: (i) Copper alloys. (ii) Aluminum alloys.	10	4