B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023
Third Semester
Mechanical Engineering
20MEPC303 - ENGINEERING METALLURGY
(Regulations 2020)

Duration: 3 Hours   Max. Marks: 100

PART - A (10 × 2 = 20 Marks)
Answer ALL Questions

		Marks, K-Level, CO
1.	State Gibb's phase rule?	2,K1,CO1
2.	What are eutectic and peritectic reactions? Give equations.	2,K1,CO1
3.	Define critical cooling rate.	2,K1,CO2
4.	List any two factors that affect harden ability of steels.	2,K2,CO2
5.	Name the industrially important copper alloys.	2,K1,CO4
6.	What are the effects of addition of boron, chromium and cobalt in steels?	2,K1,CO4
7.	List the applications of Engineering Ceramics?	2,K1,CO5
8.	Name any four commodity plastics and engineering plastics?	2,K2,CO5
9.	List the different types of fracture in a material.	2,K1,CO3
10.	What is creep? Draw a typical creep curve and show different stages on it.	2,K2,CO3

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

11. a) (i) Draw Iron-Iron carbide phase diagram, name the various field, line and reactions. — 7,K2,CO2

(ii) Draw the typical microstructures of 0.5% C steel at 920°C, 780°C and 200°C. — 6,K2,CO2

OR

b) What are the different types of cast irons? Draw the microstructure of any four types of cast irons. Give one application for each. — 13,K2,CO2

12. a) What is Annealing? Discuss in details on different types of annealing and compare with normalizing. — 13,K2,CO1

OR

b) Explain how strength can be improved by recovery, Recrystallisation and Grain growth. — 13,K2,CO1

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **12060**

13. a) Explain Age Hardening of Al-Cu with the help of a Phase Diagram. *13,K2,CO4*

    OR

    b) Discuss the Properties and Applications of i) Tool Steels ii) HSLA. *13,K2,CO4*

14. a) Discuss the properties and typical applications of the following engineering Ceramics (i) Al_2O_3, (ii)SiC, (iii) Si_3N_4 *13,K2,CO5*

    OR

    b) What is polymerization? Explain addition polymerization and condensation polymerization with examples. *13,K2,CO5*

15. a) Sketch and describe the following hardness tests. (i) Brinell (ii) Rockwell. *13,K2,CO3*

    OR

    b) Derive an expression for Griffith's Theory of brittle fracture *13,K2,C(*

PART - C (1 × 15 = 15 Marks)

16. a) Identify a suitable heat Treatment process for increasing the hardening of Al-Cu Alloy for bearing applications. *15,K3,CO6*

    OR

    b) Name the suitable alloys, polymers and ceramics for manufacturing the following items. *15,K3,CO6*

    (i) Bush
    (ii) Furnace heating element
    (iii) Lathe bed
    (iv) Coins
    (v) Girders for airship
    (vi) Big end bearing
    (vii) Turbine blades
    (viii) Conduit pipes
    (ix) Knobs
    (x) Windshields
    (xi) Touch screens
    (xii) Furnace linings
    (xiii) Grinding (abrasive) wheels
    (xiv) Coatings on cutting inserts
    (xv) Cutting inserts for ferrous alloys.