


Name:			
Enrolment No:			
UPES End Semester Examination, May 2023			
Course: Material Science Program: B.Tech AMNT Course Code: MEMA2001		Semester: 4th Time : 03 hrs. Max. Marks: 100	
Instructions: Attempt all questions			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	Describe intermediate phases in alloys with example.	4	CO1
Q 2	Describe Gibb's phase rule.	4	CO1
Q 3	Explain homogeneous and heterogeneous nucleation.	4	CO1
Q 4	Explain stress concentration.	4	CO1
Q 5	Discuss Modulus of elasticity, modulus of rigidity and Poisson's ration and their relationship.	4	CO1
SECTION B (4Qx10M= 40 Marks)			
Q 6	Describe in detail the different graded of steels and cast irons with their properties and applications.	10	CO2
Q 7	The results of a tensile test are: Diameter of specimen 20 mm, gauge length 50 mm, load at limit of proportionality 80 kN, extension at limit of proportionality 0.075 mm, maximum load 100 kN, and final length at point of fracture 60 mm. Determine (a) Young's modulus of elasticity, b) the ultimate tensile strength, (c) the stress at the limit of proportionality, (d) the percentage elongation.	10	CO3
Q 8	Explain different hardness testing methods.	10	CO2
Q 9	(a) Draw the unit cell diagram and classify seven crystal systems in terms of a , b , c and α , β , γ . (b) What is the main difference between Schottky and Frenkel defects?	5+5	CO2
OR			
	(a) Differentiate between edge and screw dislocation. (b) Difference between substitutional and interstitial solid solutions? Explain the Hume Rothery's rules.		

SECTION-C
(2Qx20M=40 Marks)

Q 10	(a) Discuss in detail the iron-iron carbide equilibrium diagram and describe the important reactions. (b) Explain the microstructure development of hypoeutectoid steel from austenite to pearlite.	10+10	CO3
OR			
	(a) Describe monotectic, eutectic, eutectoid, peritectic and peritectoid reactions. (b) The figure below shows the alloys of two components A and B. Describe in detail the microstructure development of the three alloys shown in figure.		
Q 11	(a) Discuss Full annealing, Recrystallization Annealing, Stress Relief Annealing, Spheroidization Annealing and Normalizing. (b) Discuss different surface hardening processes.	10+10	CO2