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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree (S, FE) Examination January 2024 (2015 Scheme)

Course Code: ME210

Course Name: METALLURGYAND MATERIALS ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any three questions, each carries 10 marks. Marks

1 a) Describe the effects of crystalline structure om mechanical properties. (5)

b) Discuss the polymorphism and allotropic behaviour on metals. (5)

2 a) Copper has FCC crystal structure. Determine its density if the atomic weight is 63.548 atomic radius is 1.278 Å. NA = 6.023×10^{23} (4)

b) Derive the atomic packing factor for FCC structure. (6)

3 a) Discuss the relationship between the grain size of a crystal and yield strength. (5)

b) Distinguish edge and screw dislocations with burger's vector (5)

4 a) Explain the working principle, features, and applications of SEM (10)

PART B

Answer any three questions, each carries 10 marks.

5 a) Explain the terms solubility limit and solid solutions (4)

b) Draw the phase diagram for an isomorphous system and explain the phase changes. (6)

6 a) State Hume-Rothery rules for substitutional solid solution (4)

b) Explain the properties of austenite and pearlite. (6)

7 a) Write the composition, microstructure, properties, and applications of cast iron types. (10)

8	a)	What are the mechanisms to be used to strengthen the alloys?	(7)
	b)	Explain Bauschinger effect in metal forming	(3)

PART C

Answer any four questions, each carries 10 marks.

9	a)	Discuss the characteristics of fatigue failure in metals	(5)
	b)	Explain the ways to improve the fatigue life on metals	(5)
10	a)	Distinguish between brittle and ductile fracture	(6)
	b)	Illustrate the transgranular and intergranular modes of fracture	(4)
11	a)	Explain the factors leading to crack propagation.	(5)
	b)	Explain super plasticity with examples.	(5)
12	a)	How does creep differ from fatigue? Sketch a typical creep curve and explain it.	(10)
13	a)	Explain the significance of composite materials in current trends.	4
	b)	Write the structure and applications of AX, A_mX_p type ceramic materials	6
14	a)	Discuss the need, properties and applications of intermetallic and maraging steel	10

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