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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S2 (S) Examination January 2026 (2024 Scheme)

Course Code: PCMET205

Course Name: MATERIAL SCIENCE AND ENGINEERING

Max. Marks: 60 Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks)

		CO	Marks
1	Define Space lattice, crystallography and unit cell	CO1	(3)
2	Differentiate between crystalline and amorphous solids	CO1	(3)
3	Define diffusivity, diffusion flux and concentration gradient	CO2	(3)
4	State Fick's laws of diffusion	CO2	(3)
5	Differentiate between ductility and brittleness with a suitable plot	CO3	(3)
6	What do you mean by Super-plasticity?	CO3	(3)
7	Explain the Gibbs phase rule	CO4	(3)
8	Distinguish between solid solution and a compound	CO4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module -1

			CO	Marks
9	a)	Define atomic packing factor (APF). Compute APF for BCC and FCC crystal structures	CO1	(5)
	b)	How will you determine the Miller indices for specifying a crystallographic plane?	CO1	(4)
10		What do you mean by plastic deformation? Explain the important modes of plastic deformation in metals with neat sketches.	CO1	(9)

Module -2

11		What are the different types of crystal imperfections? With neat sketches explain line defects.	CO2	(9)
12	a)	Explain anyone method of grain size determination	CO2	(5)
	b)	Explain various engineering applications of diffusion	CO2	(4)

Module -3

13	a)	What do you mean by fatigue? Discuss the important stages in fatigue failure	CO3	(5)
	b)	Explain any two hardness testing methods	CO3	(4)
14	a)	Write a note on different types of steels mentioning its important properties and applications	CO3	(5)
	b)	Discuss the importance and applications of (i) Maraging steel (ii) Titanium alloys	CO3	(4)

Module -4

15		Explain the possible microstructures in Iron - Iron Carbide system with the help of its phase diagram	CO4	(9)
16		Explain the important heat treatment methods of steels with the help of TTT diagrams.	CO4	(9)

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