Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S2 (R) Examination May 2025 (2024 Scheme)

Course Code: PCMET205

Course Name: MATERIAL SCIENCE AND ENGINEERING

Max. Marks: 60 Duration: 2hours30minutes

PART A

(Answer all questions. Each question carries 3 marks)

		CO	Marks
1	Compare the covalent, ionic and metallic bonds. Also give suitable examples.	CO1	(3)
2	Calculate the crystal lattice parameter of a palladium FCC crystal structure, having a density of 12.0 g/cm^3, and an atomic weight of 106.4 g/mol. Avogadro number is 6.022 x10 ^{23} atoms/mol	CO1	(3)
3	What are point defects? List the different point defects in crystals.	CO2	(3)
4	List the differences between SEM and TEM.	CO2	(3)
5	Explain ductile-to-brittle transition temperature.	CO3	(3)
6	How impact toughness of a material is found out? List and brief the different test methods.	CO3	(3)
7	What is an isomorphous system? Give an example.	CO4	(3)
8	Define tempering and List the various tempering processes.	CO4	(3)

PART B

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

Module -1

			CO	Marks
9	a)	Find the number of atoms, coordination number and atomic packing factor for HCP crystals.	CO1	(5)
	b)	Classify engineering materials. List and explain their important mechanical properties.	CO1	(4)
10	a)	Draw the directions and planes corresponding to the following Miller indices. (a) [101], (b) [121], (c) (111), (d) (102) and (e) (220). Write down the steps followed.	CO1	(9)

Module -2

11	a)	What are dislocations? Discuss the types of dislocations in detail with neat sketches.	CO2	(5)
	b)	What is a Frank-Read Source.? With neat sketches explain the functioning of such a source	CO2	(4)
12	a)	State and derive the expressions for Fick's laws of diffusion for steady state and non-steady state diffusion .what are the Factors affecting diffusions	CO2	(5)
	b)	Write notes on wear and super alloys	CO2	(4)

Module -3

13	a)	Define hardness? How hardness testing is done? Explain with a neat sketch.	CO3	(5)
	b)	Draw engineering stress-strain diagram and explain the important points on the curve.	CO3	(4)
14	a)	Define creep. Explain the typical creep curve of a ferrous material. Also list out the factors affecting creep.	CO3	(5)
	b)	What is steel? Classify.	CO3	(4)

Module -4

15	a)	Draw and explain a suitable eutectic system with complete solubility of components in the liquid phase and partially soluble in solid phases.	CO4	(5)
	b)	Draw and explain the TTT diagram of eutectoid steel.	CO4	(4)
16	a)	What is hardenability? Explain the Jominy End quench test.	CO4	(5)
	b)	Explain any two surface hardening methods with neat sketches.	CO4	(4)

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