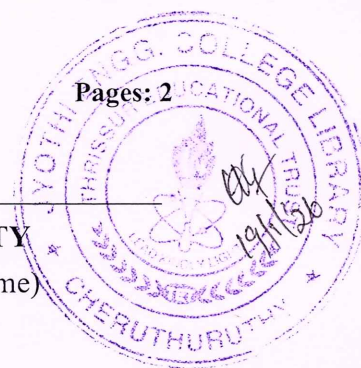


Reg No.: \_\_\_\_\_

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**

- |    |    |   |     |     |
|----|----|---|-----|-----|
| 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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