Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S,FE) Examinations June 2026 (2019 Scheme)

Course Code: RAT201

Course Name: PROCESSING AND PROPERTIES OF MATERIALS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1 Explain Hall-Petch theory. (3)

2 Explain coordination number and radius ratio. (3)

3 Explain the classification of crystal imperfections. (3)

4 Explain the significance of high and low angle grain boundaries on dislocation. (3)

5 Write three applications of nitriding. (3)

6 Explain the significance of CCT diagram. (3)

7 State three applications of nickel alloys. (3)

8 Explain the characteristics of ceramic matrix composites. (3)

9 Define heat capacity of a material. (3)

10 Discuss on electrical characteristics of commercial alloys. (3)

PART B

Answer any one full question from each module. Each question carries 14 marks

Module 1

11 a) What are Miller indices? Sketch the following planes and directions in a cubic crystal: (100), (110), (111), [021], [$\bar{2}$12] in a cubic unit cell. (6)

b) With neat sketches explain the mechanism of slip and twinning as related to plastic deformation. (8)

12 a) Copper has FCC crystal structure, determine its density if the atomic weight is 63.54 and atomic radius is 1.287Å. (7)

b) Explain the mechanism of crystallization. (7)

Module 2

13 a) Explain the procedure of polishing and etching to determine the microstructure and grain size of materials. (8)

b) With neat sketch of Burger's vector distinguish Edge and Screw dislocation. (6)

14 a) Explain Fick's second law for non steady state diffusion. (8)

b) Explain the effect of point defects on mechanical properties. (6)

Module 3

15 a) Explain Hume-Rothery's rule. (6)

b) With neat sketch explain TTT diagram for iron carbon alloy. (8)

16 a) Explain the difference between carburizing and nitriding processes. (8)

b) Explain induction hardening and electron beam hardening processes. (6)

Module 4

17 a) Explain the mechanism of deformation of elastomers. (4)

b) Explain the characteristics of Polymer Matrix Composites (PMC), Metal Matrix Composites (MMC) and Ceramic Matrix Composites (CMC). (10)

18 a) Describe five applications of composite materials in detail. (10)

b) What are the factors that influence the mechanical properties of semi crystalline polymers? (4)

Module 5

19 a) Explain the phenomenon of magnetic hysteresis. (7)

b) Distinguish between ferro magnetism and para magnetism. (7)

20 a) Write short notes on (i) electromagnetic radiation (ii) opacity and (iii) translucency in insulators. (6)

b) Explain the influence of temperature on magnetic behaviour of commercial alloys. (8)

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