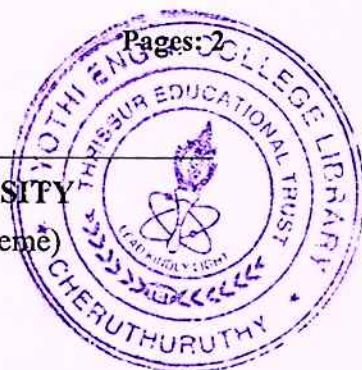


Reg No.: _____

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)
