#### 0800RAT201122004

Reg No.:\_

Name:

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY B.Tech Degree S3 (S,FE) Examination May 2025 (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	Obtain the atomic packing factor of a bcc crystal structure.	(3)
2	Explain about undercooling.	(3)
3	What are the characteristics of dislocations?	(3)
4	Write down the differences between a crystalline material and an amorphous material.	(3)
5	What are twin boundaries?	(3)
6	Define hardenability.	(3)
7	With suitable examples describe about cross-linked polymers.	(3)
8	What is glass transition temperature?	(3)
9	Explain about diamagnetic materials.	(3)
10	What is the significance of Curie temperature?	(3)
Aı	PART B nswer any one full question from each module. Each question carries 14 marks Module 1	
11(a)	Discuss about covalent bond and ionic bond	(6)
(b)	Calculate the atomic radius in cm for FCC metal with lattice constant a=4.0862 A° and one atom per lattice point.	(2)
(c)	Using an example, describe the steps involved in the determination of Miller indices of a crystallographic plane.	(6)
12(a)	Discuss about Hall-Petch relation.	(3)
(b)	Explain about any two strengthening mechanisms.	(8)
(c)	Describe the mechanism of crystallization.	(3)
	Module 2	
13(a)	Differentiate between edge and screw dislocation.	(6)
(b)	Describe the significance of ASTM grain size number. Determine the ASTM grain size number, if 25 grains/square inch are observed at a magnification of 50.	(4)

- (c) What are grain boundaries? How are they classified. (4)
- 14(a) Explain the step by step procedure for microstructure determination.(6)(3)

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(b)	Explain Fick's first law of diffusion.	(5)
(c)	List five applications of diffusion phenomena.	
	Module 3	
15(a)	Draw the phase diagram of Pb-Sn system and mark all salient points. Explain the microstructural changes with temperature, in the melt with 40%	(9)
(b)	Sn.Explain the application of lever rule using the phase diagram of a binary isomorphous alloy.	(5)
16(a)	Describe about	(8)
	i) Carburizing ii) flame hardening	
(b)	Cite the differences between pearlite and bainite relative to microstructure and mechanical properties.	(6)
	Module 4	
17(a)	Describe the mechanism of elastic deformation in semicrystalline polymers.	(4)
(b)	Discuss any two factors that influence the mechanical properties of semicrystalline polymers.	(6)
(c)	What is the distinction between matrix and dispersed phases in a composite material?	(4)
18(a)	What is a hybrid composite? (b) List two important advantages of hybrid composites over normal fiber composites.	(4)
(b)	Explain about dispersion strengthened composites.	(4)
(c)	Describe the composition, properties and applications of any two copper alloys.	(6)
	Module 5	
19(a)	Distinguish between intrinsic and extrinsic semiconducting materials.	(6)
(b)	Explain why metals are typically better thermal conductors than ceramic materials	(4)
(c)	Discuss about the influence of temperature on magnetic material.	(4)
20(a)	Describe the phenomenon of superconductivity.	(5)
(b)	What is refraction? Define index of refraction.	(4)
(c)	Explain about magnetic hysteresis	(5)

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