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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree Regular and Supplementary Examination December 2022 (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 Schmid's law and the term critical resolved shear stress.	(3)
2	Explain Polymorphism and allotropy.	(3)
3	With neat sketch explain Frenkel defect.	(3)
4	State and explain Fick's first law of diffusion.	(3)
5	Explain the process austempering.	(3)
6	Explain electron beam hardening processes.	(3)
7	Explain three mechanical properties of semi crystalline polymers.	(3)
8	Explain three applications of composites in Marine industry.	(3)
9	State the differences between diamagnetism and ferromagnetism.	(3)
10	Distinguish between materials that are transparent, opaque and translucent in terms of their light transmittance.	(3)

PART B

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

Module 1

11	a)	A metal having a cubic structure has a density of 2.6 g/cc, atomic weight of 87.62 g/ mol and lattice parameter of 6.0849 Angstrom. One atom is associated with each lattice point. Determine the crystal structure of the metal.	(8)
	b)	Explain the characteristics of BCC, FCC, HCP structures.	(6)
12	a)	Show that for a BCC cubic structure with the unit cell edge length a and atomic radius R are related through $a = 4R/\sqrt{a}$.	(9)
	b)	Show that atomic packing factor for FCC is 0.74.	(5)

Module 2

13	a)	What are the different types of crystal imperfections?	(10)
	b)	Explain the different applications of diffusion in robotic industry.	(4)

14	a)	Explain the role of surface defects on crack initiation.	(6)
	a)	Explain the procedure of polishing and etching to determine the microstructure and grain size of materials.	(8)

Module 3

15	a)	Explain martempering process.	(4)
	b)	With neat sketch explain iron carbon equilibrium diagram.	(10)
16	a)	Explain Jominy end quench test with neat sketch.	(6)
	b)	With the help of a neat sketch, explain CCT diagram for iron carbon alloy.	(8)

Module 4

17	a)	Write short notes on composite biomaterials.	(4)
	b)	Explain the applications of composites in an aircraft. What properties make them suitable for the above applications?	(10)
18	a)	What is non-ferrous alloy. Explain the properties, applications and limitations of Aluminum.	(10)
	b)	Explain the need of composite development.	(4)

Module 5

19	a)	Write short notes on electrical properties of commercial alloys.	(4)
	b)	Explain the phenomenon of magnetic hysteresis.	(10)
20	a)	Explain the significance of any two low-expansion alloys with examples.	(10)
	b)	Explain Ohm's Law and electrical conductivity.	(4)

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