Reg. No.															

Question Paper Code	13465

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Seventh Semester

Mechanical Engineering

20MEEL712 - COMPOSITE MATERIALS AND MECHANICS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What is the primary purpose of reinforcement in composites? (a) Reduce weight (b) Increase strength and stiffness (c) Enhance conductivity (d) Improve flexibility	1	K1	CO1
2.	What is the main advantage of thermoplastics over thermosets? (a) Higher stiffness (b) Recyclability (c) Low cost (d) Higher strength	1	K1	CO1
3.	Which method is best suited for making long uniform profiles in PMCs? (a) Hand layup (b) Filament winding (c) Pultrusion (d) Compression molding	1	K1	CO2
4.	What process involves injecting resin into a closed mold with dry fibers? (a) Pultrusion (b) Spray-up (c) Resin Transfer Molding (d) Filament winding	1	K1	CO2
5.	What is the primary benefit of titanium-based MMCs? (a) Low strength (b) Corrosion resistance (c) High density (d) Poor thermal stability	1	K1	CO3
6.	Which MMC processing technique occurs in the solid state? (a) Stir casting (b) Squeeze casting (c) Diffusion bonding (d) Spray deposition	1	K1	CO3
7.	Which method involves creating ceramics through chemical precipitation? (a) Slip casting (b) Co-precipitation (c) Tape casting (d) Calendaring	1	K1	CO4
8.	What is the main reinforcement in carbon-carbon composites? (a) Ceramic fibers (b) Glass fibers (c) Carbon fibers (d) Metallic whiskers	1	K1	CO4
9.	What does the β-matrix in laminated constitutive equations represent? (a) Extensional stiffness (b) Bending stiffness (c) Coupling stiffness (d) Shear stiffness	1	K1	CO5
10.	What property is critical for CMCs in high-temperature environments? (a) Low weight (b) Wear resistance (c) Thermal stability (d) Electrical conductivity	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	What is a composite material?	2	K1	CO1
12.	Why are composite materials needed in the aerospace industry?	2	K1	CO1
13.	Define hand layup in polymer matrix composites.	2	K1	CO2
14.	Differentiate between pultrusion and filament winding techniques in polymer matrix composites.	2	K2	CO2
15.	State one advantage of powder metallurgy techniques in MMC manufacturing.	2	K1	CO3
16.	Define diffusion bonding in the context of metal matrix composites.	2	K1	CO3
17.	Define Ceramic Matrix Composites.	2	K1	CO4
18.	List four physical methods used in the processing of Ceramic Matrix Composites.	2	K1	CO4
19.	Compare balanced and symmetric laminates in terms of their stacking sequences.	2	K2	CO5
20.	Define Quasi-Isotropic Laminates in mechanics of composites.	2	K1	CO5
21.	List the method of consolidation used in the processing of Ceramic Matrix Composites.	2	K1	CO6
22.	What is the process of slip casting in the shaping of Ceramic Composites?	2	K1	CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	List the characteristics of composite materials and state some of their applications.	*11*	*K1*	*CO1*
		OR			
	b)	Write the physical and chemical properties of various plant fibers.	*11*	*K1*	*CO1*
24.	a)	Explain the hand layup composite fabrication process with appropriate sketches.	*11*	*K2*	*CO2*
		OR			
	b)	Explain various thermoplastic matrix composite fabrication processes with sketch.	*11*	*K2*	*CO2*
25.	a)	With neat sketches explain about in situ process by unidirectional solidification.	*11*	*K2*	*CO3*
		OR			
	b)	Explain any two processing techniques of MMCs with neat sketches.	*11*	*K2*	*CO3*
26.	a)	Explain with a neat sketch, the techniques of consolidation and shaping of Ceramic Composites.	*11*	*K2*	*CO4*
		OR			
	b)	Explain the Carbon Fiber Reinforcements Matrix Systems with neat sketches.	*11*	*K2*	*CO4*
27.	a)	Explain (a) Generalized Hooke's Law (b) Laminated anisotropic plates.	*11*	*K2*	*CO5*
		OR			
	b)	Derive the expression for lamina constitutive equations.	*11*	*K2*	*CO5*
28.	a)	Write the mechanical properties and applications of CMCs in detail.	*11*	*K1*	*CO6*
		OR			
	b)	Write about the sintering techniques in CMC's with neat sketches.	*11*	*K1*	*CO6*