

Reg. No.																			
-----------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code	13949
----------------------------	--------------

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 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

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. _____ fiber has the best strength-to-weight ratio? (a) Glass fiber (b) Carbon fiber (c) Boron fiber (d) Ceramic fiber	1	K2	CO1
2. What is the main constituent of the matrix in polymer composites? (a) Metals (b) Ceramics (c) Polymers (d) Organic fibers	1	K1	CO1
3. What is the primary advantage of thermoplastic matrix composites? (a) High-temperature resistance (b) Recyclability (c) Low strength (d) Cost-effectiveness	1	K1	CO2
4. _____ ensures efficient load transfer in PMCs? (a) Balanced laminates (b) Strong interfacial bonding (c) Thermoplastic matrix (d) Cross ply laminates	1	K2	CO2
5. Which property is a key advantage of aluminum-based MMCs? (a) High melting point (b) Lightweight and corrosion resistance (c) High electrical conductivity (d) Magnetic properties	1	K1	CO3
6. What is a characteristic of in situ fabrication techniques? (a) Uses pre-made reinforcements (b) Forms reinforcements within the matrix during processing (c) Limited to low-temperature processes (d) Only applicable to titanium-based MMCs	1	K1	CO3
7. Which process is used to create thin ceramic sheets? (a) Calendaring (b) Tape casting (c) Multilayering (d) Slip casting	1	K1	CO4
8. Which process uses resin impregnation followed by pyrolysis for C-C composites? (a) Hot pressing (b) Liquid impregnation (c) CVI (d) Calendaring	1	K1	CO4
9. What type of sintering involves a liquid phase to aid densification? (a) Solid-state sintering (b) Liquid phase sintering (c) Chemical vapor impregnation (d) Hydrothermal synthesis	1	K1	CO5
10. Which method involves infiltrating ceramics with vapor precursors? (a) Hydrothermal synthesis (b) Chemical vapor impregnation (c) Powder metallurgy (d) Squeeze casting	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11. Why are composite materials needed in the aerospace industry?	2	K1	CO1
12. What are the properties of thermosetting plastics?	2	K1	CO1
13. Tell one mechanical property enhanced in polymer matrix composites compared to traditional materials.	2	K1	CO2
14. Differentiate between balanced and symmetric laminates in polymer matrix composites.	2	K2	CO2
15. Define metallic matrices in metal matrix composites.	2	K1	CO3
16. Name one processing technique for MMCs involving the liquid state of the matrix material.	2	K1	CO3

- | | | | |
|--|---|----|-----|
| 17. Name one chemical route for the synthesis of Ceramic Matrix Composites. | 2 | K1 | CO4 |
| 18. Define Powder Processing in the context of Ceramic Matrix Composites. | 2 | K1 | CO4 |
| 19. Define Coupling Interactions in Laminate Constitutive Equations. | 2 | K1 | CO5 |
| 20. Recall the purpose of determining Lamina stresses within Laminates. | 2 | K1 | CO5 |
| 21. What is the process of slip casting in the shaping of Ceramic Composites? | 2 | K1 | CO6 |
| 22. Outline the calendaring and multilayering techniques in the shaping of Ceramic Composites. | 2 | K2 | CO6 |

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

- | | | | |
|---|----|----|-----|
| 23. a) Explain the various industrial applications of composite materials with examples. | 11 | K2 | CO1 |
| OR | | | |
| b) Classify polymers with suitable industrial applications. | 11 | K2 | CO1 |
| 24. a) Explain the compression moulding composite fabrication process with appropriate sketches. | 11 | K2 | CO2 |
| OR | | | |
| b) Explain the filament winding composite fabrication process with appropriate sketches. | 11 | K2 | CO2 |
| 25. a) Compare the process of liquid state and Solid state in MMC's. | 11 | K2 | CO3 |
| OR | | | |
| b) Explain the various metallic matrices used in MMC's with suitable applications. | 11 | K2 | CO3 |
| 26. a) Explain about the processing of Carbon-Carbon composites. | 11 | K2 | CO4 |
| OR | | | |
| b) Explain the properties of Carbon –Carbon Composites and its applications. | 11 | K2 | CO4 |
| 27. a) Explain the following with examples. (a) Quasi-Isotropic Laminates (b) Lamina stresses within Laminates. | 11 | K2 | CO5 |
| OR | | | |
| b) Explain the following with examples. (a) Orthotropic Stiffness matrix (b) Strain Displacement relations. | 11 | K2 | CO5 |
| 28. a) Illustrate the techniques of consolidation and shaping of Ceramic Composites in detail. | 11 | K2 | CO6 |
| OR | | | |
| b) Demonstrate the industrial applications of CMC's with suitable examples. | 11 | K2 | CO6 |