QP Code: RA21BTECH809 | Reg. No | | | | | | | | | | | AR 21

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Eighth Semester - Regular) Examinations, April – 2025

21BMEPE48011 – Composite Material

(Mechanical Engineering)

Time: 3 hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Define composite materials with examples.	CO1	K1
b. What is the role of reinforcement in composites?	CO1	K2
c. Name two processing techniques for metal matrix composites.	CO2	K1
d. How does fiber orientation affect composite properties?	CO3	K4
e. What is the significance of Poisson's ratio in micromechanics?	CO4	K3

PART – B **(15 x 4 = 60 Marks)**

Answer ***all*** the questions	Marks	CO #	Blooms Level
2. a. Differentiate between natural and synthetic fiber reinforcements.	8	CO1	K2
b. Explain the factors affecting the properties of composite materials.	7	CO1	K2
(OR)			
c. Discuss the role of fiber-matrix bonding in composite performance.	8	CO1	K2
d. Explain the role of matrix and interface in composite materials.	7	CO1	K2
3.a. Describe the powder metallurgy process for MMC fabrication.	8	CO2	K2
b. A unidirectional composite has the following properties: Fiber modulus: 250 GPa, Matrix modulus: 2.5 GPa, Fiber volume fraction: 0.6 Calculate the longitudinal modulus of elasticity.	7	CO4	K3
(OR)			
c. Explain the working principle of squeeze casting in MMCs.	8	CO2	K2
d. A unidirectional fiber-reinforced composite consists of 60% fiber and 40% matrix by volume. Given: Elastic modulus of fiber = 200 GPa, Elastic modulus of matrix = 50 GPa. Use the rule of mixtures to calculate the longitudinal modulus of elasticity.	7	CO1	K3
4.a. Explain the sol-gel processing technique used in ceramic matrix composites.	8	CO2	K2
b. Discuss the processing and applications of SiC-whisker-reinforced alumina composites.	7	CO3	K3
(OR)			
c. Differentiate between thermosetting and thermoplastic polymer matrices.	8	CO2	K2
d. Discuss the recycling challenges of polymer matrix composites.	7	CO3	K3
5.a. How does fiber aspect ratio influence the mechanical properties of composites?	8	CO3	K4
b. A composite consists of fibers with a shear modulus of 30 GPa and a matrix with a shear modulus of 5 GPa. Using micromechanics principles, estimate the shear modulus of the composite (assuming fiber volume fraction = 0.6).	7	CO4	K3
(OR)			
c. Derive the expression for longitudinal stiffness of fiber-reinforced composites.	8	CO4	K3
d. Discuss how composite materials contribute to sustainability and societal applications.	7	CO3	K4

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