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GIET UNIVERSITY, GUNUPUR – 765022

Ph.D. (First Semester) Examinations, January – 2024

23SPPEME1010 – Composite Materials

(Mechanical)

Time: 3 hrs

Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer ANY FIVE Questions

(14 x 5 = 70 Marks)

	Marks
1.a. Compare and contrast the properties of carbon fiber composites with those of traditional materials such as metals, ceramics, and polymers.	7
b. Delve into the classifications of reinforcements and matrices in composite materials. Provide detailed explanations of the types of reinforcements and matrices used in composites, along with their respective characteristics.	7
2.a. Investigate the manufacturing processes involved in producing carbon fiber composites. Discuss the key steps, technologies, and considerations in the fabrication of carbon fiber composites.	7
b. Explain the significance of the fiber/matrix interface in composite materials. Discuss how the interface influences the mechanical properties of composites and provide examples of how variations impact performance.	7
3.a. Discuss the importance of accurate interface strength measurement in predicting composite material performance.	7
b. Discuss how the choice of fiber and matrix influences the overall performance and applications of these composites in different industries.	7
4.a. How do volume and weight fraction influence the stiffness and strength of composite materials? Discuss their impact on unidirectional continuous fiber composites, discontinuous fiber systems, short fiber systems, and composites with woven reinforcements.	14
5.a. What role do continuous fibers play in enhancing the stiffness and strength of composite materials?	7
b. Evaluate the testing methods used to determine the mechanical properties of composites. Discuss the advantages and limitations of tension, compression, flexure, and shear tests, and explore how the choice of testing method influences result interpretation.	7
6.a. Discuss the influence of fiber orientation and the challenges and advantages associated with the mechanical testing of composites reinforced with woven materials, considering factors such as anisotropy.	7

- b. Explain the concepts of plate stiffness and compliance in laminates, covering assumptions, strains, and stress resultants. 7
- 7.a. Discuss the properties and characteristics of orthotropic laminates, emphasizing their moduli and how they differ from other types of laminates. 7
- b. Discuss the effects of moisture and temperature variations on the mechanical performance of laminated structures, and how these factors contribute to the development of stresses. 7
- 8.a. Discuss the advantages and disadvantages of adhesive joints in the context of joining methods. 7
- b. Evaluate the influence of temperature, moisture, and other environmental factors on the performance of adhesive joints. 7

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