

# CBCS SCHEME

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18AE54

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024

## Introduction to Composite Materials

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Define composite materials. Explain Thermoset and Thermoplastic polymers. (10 Marks)  
b. List Advantages, Disadvantages and applications of composites. (10 Marks)

OR

- 2 a. List all the liquid state fabrication of metal matrix composites? With a neat sketch explain any one method of liquid state fabrication of metal matrix composites. (10 Marks)  
b. Explain:  
i) Particulate composite  
ii) Fibrous composites  
iii) Whiskers  
iv) Flakes. (10 Marks)

### Module-2

- 3 a. With a neat sketch, explain Hand layup process? List advantages, disadvantages and application of Hand layup process. (10 Marks)  
b. With a neat sketch, explain, pultrusion process? And also list and advantages, Disadvantages and applications of pultrusion process. (10 Marks)

OR

- 4 a. Explain with neat sketch :  
i) Extrusion process  
ii) Injection molding. (10 Marks)  
b. Explain:  
i) Adhesive bonding  
ii) Drilling  
iii) Cutting processes. (10 Marks)

### Module-3

- 5 a. Derive density interms of volume fraction. (06 Marks)  
b. What are the assumptions in a typical micro mechanical analysis? (06 Marks)  
c. Derive the equation for elastic modulus of a composite laminate. (08 Marks)

OR

- 6 a. Define volume and mass fractions of fibre and matrix and derive expression for them. (08 Marks)  
b. What are the assumptions made in macro-mechanics? (04 Marks)  
c. Using strength of materials approach, derive expression for effective axial modulus, Poisson's ratio and transverse modulus. (08 Marks)

**Module-4**

- 7 a. Discuss modes a failure in composites. (05 Marks)  
b. Explain maximum stress and maximum strain failure theories used in the composites. (10 Marks)  
c. List merits and demerits of T-sai-hill failure theory. (05 Marks)

**OR**

- 8 a. Derive the expression for [A] [B] and [D] matrices for laminate. (14 Marks)  
b. Explain the basic assumptions in the classical laminate plate theory. (06 Marks)

**Module-5**

- 9 a. With a neat sketch, explain any one type of Non-Destructive Testing (NDT)? (10 Marks)  
b. With a neat sketch, explain any one type of Destructive testing. (10 Marks)

**OR**

- 10 a. Discuss the applications of composites from day to day requirements to the advance applications in space with example. (15 Marks)  
b. Explain future potential of composites. (05 Marks)

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