

# CBCS SCHEME

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21AE642

## Sixth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025 Composite Materials and Structures

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. What are the special features of a structural composite? (10 Marks)
- b. Compare between natural and man-made structural composites. (10 Marks)

OR

- 2 a. Why composites are favoured in engineering applications? (10 Marks)
- b. Write a brief note on their uses in various engineering disciplines. (10 Marks)

### Module-2

- 3 a. Why fibres are preferred to other reinforcements? What are Whiskers? (10 Marks)
- b. What are carbon-carbon composites and why they are recommended for high temperature applications? (10 Marks)

OR

- 4 a. Write a note on :  
(i) Metal matrix composite (ii) Ceramic matrix composite (10 Marks)
- b. Describe the characteristics of two thermosets and thermoplastics used in aerospace applications. (10 Marks)

### Module-3

- 5 a. Describe the moulding process of composites :  
(i) Matched-die mould method (ii) Contact mould method (10 Marks)
- b. Write notes on :  
(i) Filament winding (ii) Pultrusion (10 Marks)

OR

- 6 a. Discuss the joining techniques for metal matrix composites and ceramic matrix composites. (10 Marks)
- b. Describe the (i) diffusion bonding and (ii) casting process for metal matrix composites. (10 Marks)

### Module-4

- 7 Using simple rule of mixture, derive expressions for (i)  $E_{11}$ , (ii)  $E_{22}$ , (iii)  $G_{12}$  and (iv)  $\gamma_{12}$  (20 Marks)

OR

- 8 Write the advantages and disadvantages of NDT methods used in composite testing:  
a. Acoustic emission (10 Marks)
- b. Holographic Interferometry. (10 Marks)

**Module-5**

- 9 a. State the generalized Hooke's law for a 3-D elastic anisotropic material and show it has 21 independent elastic constants. (10 Marks)
- b. Write the stiffness matrix for orthotropic, transversely isotropic and isotropic materials and show they have 9, 5 and 2 independent elastic constants respectively. (10 Marks)

**OR**

- 10 a. Derive the stress-strain relation for 1-D isotropic beam. (10 Marks)
- b. Derive the strain-displacement equation for plate under in-plane axial, shear and bending loads. (10 Marks)

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