Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 60550

M.E./M.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Elective

CAD / CAM

ED 4072 — COMPOSITE MATERIALS AND MECHANICS

(Common to M.E. Computer Aided Design / M.E. Engineering Design)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List out the application of reinforced composite materials.
2. What are the characteristics of fiber-reinforced composites?
3. Differentiate between Metal Matrix Composites, Polymer Matrix Composites and Ceramic Matrix Composites.
4. List out the types of infiltration techniques.
5. Write down the stiffness matrix for orthotropic materials.
6. List down the assumptions for laminated anisotropic plates.
7. What are three common modes of failure of a unidirectional composite subjected to Longitudinal tensile load?
8. What is free vibration of laminated plates?
9. Show the modification of Hooke's Law.
10. What is thermal spiking?

PART B — (5 × 13 = 65 marks)

11. (a) Discuss the characteristics and properties of natural fibers used in composites.

Or

(b) Explain how the Rule of Mixtures is applied to predict the properties of composite materials based on the properties of individual constituents.

12. (a) Discuss about the Resin Transfer Moulding and state its applications.

Or

(b) With neat sketches explain :

(i) Pultrusion (7)

(ii) Filament Winding. (6)

13. (a) Discuss about the basic assumptions of laminated anisotropic plates.

Or

(b) With neat sketches discuss the stress analysis of angle ply laminates and cross ply laminates.

14. (a) Discuss in detail the following failure theories and specify the advantages an disadvantage of each over the other.

(i) Tsai-Hill failure Theory (7)

(ii) Tsai-Wu failure Theory. (6)

Or

(b) Discuss about the strength analysis procedure for laminates.

15. (a) Discuss about the thermo mechanical stresses in FRP laminates.

Or

(b) Explain the fabrication stresses and residual stresses in FRP laminates composites.

PART C — (1 × 15 = 15 marks)

16. (a) Find the deflection of a thin square laminated plate of size 50 × 50 mm consisting of four layers [0/90/90/0] of equal thickness with b/h = 100 having all edges simply supported. The properties of a graphite/epoxy laminated plate are listed below :

E_{11} = 181 CPa;

E_{22} = 10.30 GPa;

V_{12} = 28.0;

G_{12} = 7.17 GPa.

Or

(b) Explain the characteristics of the following laminates :

(i) Unidirectional Laminates (4)

(ii) Symmetric Balanced Laminates (4)

(iii) Zero CTE Laminates (4)

(iv) Thermally Quasi – Isotropic Laminates. (3)
