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

Question Paper Code: 92015

M.E. DEGREE EXAMINATION, OCTOBER 2014.

Elective

CAD / CAM

01PCD525 – COMPOSITE MATERIALS AND MECHANICS

(Regulation 2013)

(Approved Data Book may be permitted)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Define composites.
2. Give any two surface preparation techniques of composites.
3. Write the stiffness matrix for monolithic and orthotropic materials.
4. Why the residual stresses needs to be studied?
5. What is compliance matrix? And classify it.
6. Write short notes on inter laminar stresses.
7. Mention the commonly used failure criterion for FRP.
8. Illustrate the different modes of fracture mechanics.
9. List the demerits of ceramic matrix composites.
10. Write the merits of composite joints.

PART – B (5 x 14 = 70 Marks)

11. (a) Explain in detail about the classification of composite materials. (14)

Or

(b) (i) Explain in detail about the various bonding techniques of composites. (7)

(ii) Discuss the mechanical, thermal and physical properties of UD fiber composite laminates. (7)

12. (a) (i) Calculate the longitudinal modulus and tensile strength of a UD composite containing 60% by volume of carbon fibers (E_f = 294 GPa and σ_f = 5.6 GPa) in an epoxy matrix (E_m = 3.6 GPa and σ_m= 105 MPa). What fraction of the load is carried by fibers in the composite? (8)

(ii) An isotropic lamina has E = 100 kN/mm^2 and ν = 0.25. Determine the reduced stiffness matrix. (6)

Or

(b) Find the compliance and stiffness matrix for a graphite/epoxy lamina. The material properties are given as: E_1 = 181 GPa , E_2 = 10.3 GPa, E_3 = 10.3 GPa; ν_{12} = 0.28, ν_{23} = 0.60, ν_{13} = 0.27 ; G_{12} = 7.17 GPa, G_{23} = 3 GPa, G_{13} = 7 GPa. (14)

13. (a) Derive the expression for finding the stress strain relation for angle ply laminates. (14)

Or

(b) Compute all terms of the [A], [B] and [D] matrices for [0/60] laminate with the lamina properties. (14)

14. (a) Explain in detail about Tsai-Hill failure criterion and Maximum strain failure theory. (14)

Or

(b) Explain in detail about sandwich construction. (14)

15. (a) Explain in detail about the applications of

(i) Metal Matrix Composites (7)

(ii) Ceramic Matrix Composites (7)

Or

(b) (i) Briefly explain about Composite Joints. (7)

(ii) Discuss in detail about the application of composites in sports field. (7)

PART – C (1 x 10 = 10 Marks)

16. (a) Discuss the environmental factors to be considered while the design of composites. (10)

Or

(b) Explain in detail any one of the manufacturing methods suitable for natural fiber reinforced polymer composites. (10)