PVP 12

Code: **MEMD1T3**

I M.Tech - I Semester - Regular Examinations – February-2016

MECHANICS OF COMPOSITE MATERIALS
(MACHINE DESIGN)

Duration: 3 hours Max. Marks: 70

Answer any FIVE questions. All questions carry equal marks

1. a) What are the advantages of conventional composite materials over conventional materials? 7 M

   b) Discuss the applications of various composite materials. 7 M

2. a) Explain the significance of particulate composites. 7 M

   b) List out different matrix materials used in composite materials. Discuss specific applications of each composite material. 7 M

3. a) List out the methods of manufacturing thermosetting resin matrix composite materials and mention their salient features. 7 M

   b) Explain the technique to manufacture cylindrical objects of composite materials. 7 M

4. Write stress-strain relations for a unidirectional lamina in terms of engineering constants referred to an arbitrary coordinate system (x, y). 14 M

5. a) Deduce transformation relations for elastic constant, G_{xy} in terms of engineering constants $(E_1, E_2, G_{12}, \nu_{12} \text{ and } \nu_{21})$. 8 M

b) Discuss the more widely used macromechanical failure theories for composites. 6 M

6. a) Discuss the factors influencing longitudinal strength and stiffness of unidirectional composites. 6 M

b) Calculate the ratios of longitudinal modulus of the composite to the matrix modulus for glass-epoxy and carbon-epoxy composites with 10% and 50% fibers by volume. Elastic modulus of glass fiber, carbon fibers and epoxy resin are 70, 350, and 3.5 GPa, respectively. Comment on the results. 8 M

7. a) Explain the hygrothermal effects in a laminate. 6 M

b) Compute all terms of extensional stiffness matrix and coupling stiffness matrix for a $[+45/-45]$ laminate with the following lamina properties. $E_1 = 145\,GPa$; $E_2 = 105\,GPa$; $G_{12} = 7.5\,GPa$; $\nu_{12} = 0.28$; lamina thickness: $t = 0.25\,mm$. 8 M

8. a) Discuss the different failure criteria applied in the design of composite laminates. 8 M

b) Explain the importance of optimization of laminated structures. 6 M