USN ☐☐☐☐☐☐☐☐☐☐

18AE54

Fifth Semester B.E. Degree Examination, June/July 2023
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 composites and justify why the composites are better than conventional materials.
                                                                              (10 Marks)
   b. Discuss various fibers used in the composite manufacturing.   **(10 Marks)**

OR

2 a. Classify composites based on reinforcement, the type of matrix.   **(10 Marks)**
   b. Explain metal matrix composites from Al, Si, Mg, Ti with examples.   **(10 Marks)**

Module-2

3 a. With neat sketch, explain the hand layup process in composite manufacturing. **(10 Marks)**
   b. Explain Pultrusion forming of composite manufacturing with advantages over the other processes.   **(10 Marks)**

OR

4 a. Describe vacuum bag molding of composite manufacturing.   **(10 Marks)**
   b. Explain filament winding used for aerospace applications.   **(10 Marks)**

Module-3

5 a. Derive the equation for elastic modulus of a composite laminate.   **(10 Marks)**
   b. Calculate the modulus of elasticity of a composite materials consisting of 60% by volume of continuous E-glass fiber and 40% epoxy resin for the matrix. When stressed under iso-stress condition. The modulus of elasticity of E-glass is 72.4GPa and that of the epoxy resin is 3.1GPa.   **(10 Marks)**

OR

6 a. Define volume and mass fractions for fibre and matrix and derive expressions for same.
                                                                              (10 Marks)
   b. Using strength of material approach, derive expression for effective axial modulus, Poissons ratio.   **(10 Marks)**

Module-4

7 a. Define composite failure and discuss the modes of failure in composites. **(10 Marks)**
   b. Explain Tsai-hill failure theory with its merits.   **(10 Marks)**

OR

8 Derive the expressions for [A], [B] and [D] matrices.   **(20 Marks)**

Module-5

9 a. Suggest the experimental setup to test composites for tension and shear properties.
                                                                              (10 Marks)
   b. Discuss various NDT used for the composites.   **(10 Marks)**

OR

10 a. Explain ultrasonic testing of composites mentioning its merits.   **(10 Marks)**
   b. Discuss the applications of composites from day today requirements to the advanced applications in space with examples.   **(10 Marks)**

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