Code No: 158AJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, September - 2022
COMPOSITE MATERIALS
(Mechanical Engineering)

Time: 3 Hours   **Max. Marks:75**

Answer any five questions
All questions carry equal marks

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1.a) Classify composites based on microstructure, matrix and reinforcements. Give examples.
  b) Contrast the mechanical characteristics of matrix and dispersed phases for fiber reinforced composites. [8+7]

2.a) What are the advantages of thermoplastic matrices over thermosets?
  b) Compare polymer matrix and metal matrixes. [7+8]

3.a) List the types of fibers used as reinforcements in composites.
  b) What are the properties that make glass fibers an important reinforcement material for composites?
  c) What are the characteristics of E-glass? [4+6+5]

4.a) With the help of neat sketch, describe the Hand lay-up and Filament winding processes.
  b) What are the advantages of polymer matrix composites over ceramic matrix composites? [8+7]

5.a) Classify the Polymer Matrix Composites (PMCs). List their important properties.
  b) Describe any two processing methods for thermoset matrix composites. [7+8]

6. Write short notes on the following:
   a) Liquid infiltration for manufacture of Metal Matrix Composites
   b) Diffusion bonding
   c) Powder Processing
   d) Deformation processing. [4+4+4+3]

7.a) Describe the diffusion bonding process for fabrication of Metal Matrix Composites.
  b) Discuss about Cladding in detail. [8+7]

8.a) Derive the reduced stiffness matrix in terms of engineering constants for an orthotropic material under plane stress condition.
  b) Compute the extensional stiffness matrix A $_{ij}$ for the laminate [0/90/0/90]. The properties of the unidirectional composite are
  $E_{11} = 155$ GPa, $E_{22} = E_{33} = 12.1$ GPa,
  $\upsilon_{12} = \upsilon_{13} = 0.248$, $\upsilon_{23} = 0.455$
  $G_{12} = G_{13} = 4.4$ GPa, $G_{23} = 3.2$ GPa
  Assume thickness of each layer is 0.15 mm. [7+8]

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