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18ME645

Sixth Semester B.E. Degree Examination, July/August 2022
Composite Materials Technology

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define Composite Materials. Give the detailed classification of composites. Discuss about role of matrix and reinforcement in composite structure. **(10 Marks)**

b. Write short notes on laminated composites, fiber reinforced composites and particulate composites with suitable sketches. **(10 Marks)**

OR

2 a. With a neat sketch, explain the production of carbon fibers. **(10 Marks)**

b. Explain Fibre-matrix interface concept. Discuss briefly about chemical, mechanical and reaction bonding concepts related to fibre-matrix interface. **(10 Marks)**

Module-2

3 a. List the differences between thermoset and thermoplastics with examples. **(06 Marks)**

b. With neat sketch, discuss the production of FRP's using Filament winding process. **(07 Marks)**

c. With neat sketch, explain production of FRP's using pultrusion technique. **(07 Marks)**

OR

4 a. Write short notes on metal matrix composite and explain about any three commonly used base metals in MMC's. **(10 Marks)**

b. Discuss in detail about production of MMC's using powder metallurgy route. **(10 Marks)**

Module-3

5 a. List out the mechanical methods of powder production systems. Explain any one with neat sketch. **(10 Marks)**

b. Write short notes on wet spinning and dry spinning with a neat sketch. **(10 Marks)**

OR

6 a. Discuss with a neat sketch powder shaping using slip casting. **(10 Marks)**

b. Write short notes on carbon-carbon composites. List the properties and application of carbon-carbon composites. **(10 Marks)**

Module-4

7 a. Write a short notes on Biocomposites. **(05 Marks)**

b. With a neat sketch, explain the self healing self reinforce composites. **(10 Marks)**

c. Explain the concept of hybrid laminates. **(05 Marks)**

OR

8 a. With a neat sketch, discuss drop weight impact test used for non-conventional composites. **(10 Marks)**

b. What are nanocomposite? Give the detailed classification of nano composites and explain any one. **(10 Marks)**

Module-5

9 a. Derive the expression for the longitudinal and transverse Young's modulus of a lamina. **(14 Marks)**

b. A polymer composite has 70% glass fibre in epoxy resin. If the elastic modulus of the glass is 85GPa and epoxy is 3.4GPa. The Poisson's ratio of fibre is 0.2 and matrix is 0.3. Determine:

i) Longitudinal Young's modulus.
ii) Transverse Young's modulus.
iii) Major and Minor Poisson's ratio. **(06 Marks)**

OR

10 a. Explain maximum stress and maximum strain failure theories of composites. **(10 Marks)**

b. For a graphite/epoxy unidirectional lamina. Find the following: i) Compliance matrix ii) Minor poisons ratio iii) Reduced stiffness matrix,
Consider σ_1 = 2MPa, σ_2 = -3MPa, τ_{12} = 4MPa, E_1 = 181GPa, E_2 = 10.3GPa, γ_{12} = 0.28, G_{12} = 7.17GPa. **(10 Marks)**

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