CBCS SCHEME

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17AE52

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. What is a composite material and how are they classified? **(05 Marks)**

b. What are the limitations of modern composites? **(05 Marks)**

c. What advantages and drawbacks do composites have over metals? **(10 Marks)**

OR

2 a. Give five examples of naturally found composites. What are the constituents of these natural composites? **(10 Marks)**

b. Define the following:
i) Isotropic body
ii) Orthotropic body
iii) Anisotropic body
iv) Homogeneous body and
v) Non homogeneous body. **(10 Marks)**

Module-2

3 a. What are the fiber factors contribute to the mechanical performance of a composite? **(10 Marks)**

b. What are the matrix factors contribute to the mechanical performance of a composite? **(10 Marks)**

OR

4 a. Describe extrusion and injection moulding manufacturing method of polymer matrix composites with neat sketch. **(10 Marks)**

b. Applications of polymer matrix, ceramic matrix and carbon matrix. **(10 Marks)**

Module-3

5 Based on the strength of material approach, determine the four elastic moduli of a unidirectional lamina
i) Longitudinal Young's modulus E_1
ii) Transverse Young's modulus E_2
iii) Major Poisson's ratio V_{12}
iv) In-Plane shear modulus, G_{12} **(20 Marks)**

OR

6 a. Number of independent elastic constants for three-dimensional anisotropic, monoclinic, orthotropic, transversely isotropic and isotropic materials. **(05 Marks)**

b. Derive the stress transformation matrix from local fiber coordinate system (x-y) to global coordinate system (1-2) in two-dimensional. **(15 Marks)**

Module-4

7 a. Based on the Von-Mises distortional energy theory, determine the parameters of Tsai-Hill failure criterion. **(15 Marks)**

b. Explain maximum stress and maximum strain theory through Mohr circle diagram. **(05 Marks)**

OR

8 Based on classical laminate plate theory, derive the forces {N} and moments {M} resultants related to midplane strains and curvatures of a laminate. **(20 Marks)**

Module-5

9 a. Applications of composite materials in
i) Automobile industry
ii) Aerospace industry
iii) Sports equipment. **(15 Marks)**

b. Short notes on future potential of composites. **(05 Marks)**

OR

10 a. Explain destructive and non-destructive testing of composite structures. **(10 Marks)**

b. Explain tensile, compression, flexural, shear and hardness testing of composite structural component. **(10 Marks)**

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