CBCS SCHEME

USN | | | | | | | | | | |

17AE52

Fifth Semester B.E. Degree Examination, Aug./Sept.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. Define Composite Material. List out how composite materiala are broadly classified with an example in each. **(10 Marks)**

b. Write a note on carbon-carbon composites with its advantages, disadvantages and applications. **(10 Marks)**

OR

2 a. Define MMC's. Write the type of matrix and reinforcement used in their manufacturing process. **(10 Marks)**

b. Explain liquid mettalorgy technique used manufacturing of MMC's. **(10 Marks)**

Module-2

3 Explain the below manufacturing process with neat sketch:

a. Handlay-up process

b. Vacuum Bagging Process **(20 Marks)**

OR

4 Explain the below manufacturing process with neat sketch:

a. Extrusion Process

b. Injection Moulding Process **(20 Marks)**

Module-3

5 Evaluate Longitudinal Young's modulus (E_1) and transverse Young's modulus (E_2) by the rule of mixture. **(20 Marks)**

OR

6 For a graphite/epoxy unidirectional lamina, find the following:

(i) Compliance matrix

(ii) Minor Poisson's ratio

(iii) Reduced stiffness matrix

(iv) Strains in the 1-2 coordinate

System if the applied stresses are $\sigma_1 = 2$ MPa, $\sigma_2 = -3$ MPa, $\tau_{12} = 4$ MPa. Given, $E_1 = 181$ GPa, $E_2 = 10.3$ GPa, $\gamma_{12} = 0.28$, $G_{12} = 7.17$ GPa. **(20 Marks)**

Module-4

7 For failure analysis of a unidirectional lamina subjected to a 2D plane stress state and express in equation form the maximum stress criterion, the Tsai-Hill criteria and the Tsai-WU criterion? **(20 Marks)**

OR

8 Derive the below equation with neat sketch:
(i) Classical laminate theory
(ii) [A] [B] [D] matrices **(20 Marks)**

Module-5

9 a. Explain the distinctive testing methods shown below:
(i) Tensile
(ii) Compression
(iii) Shear **(12 Marks)**

b. Explain the non-destructive testing methods shown below:
Ultrasonic A – B – C scan **(08 Marks)**

OR

10 a. List the advantages and limitations of composite materials in detail. **(10 Marks)**

b. Write a note on application of composite materials in Aircraft, Automobile and Missiles. **(10 Marks)**

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