

# CBCS Scheme

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16MST21

Second Semester M.Tech. Degree Examination, Dec.2017/Jan.2018

## Composite Materials Technology

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Define a Composite materials and explain the classification of composite materials. (05 Marks)
- b. Explain the Fiber composite, Laminated composite and Particulate composite. (06 Marks)
- c. Explain with sketch, Prepreg manufacturing. (05 Marks)

OR

- 2 a. Write the stress strain relationship for the following materials: (09 Marks)
- i) Monoclinic materials ii) Isotropic material iii) Orthotropic material.
- b. For a graphite/epoxy unidirectional lamina, find the following:
- i) compliance matrix ii) Minor Poisson's ratio iii) Reduced stiffness matrix.
- $\sigma_1 = 2\text{MPa}$ ,  $\sigma_2 = -3\text{MPa}$ ,  $\tau_{12} = 4\text{MPa}$ ,  $E_1 = 181\text{GPa}$ ,  $E_2 = 10.3\text{GPa}$ ,  $V_{12} = 0.28$ ,  $G_{12} = 7.17\text{GPa}$ . (07 Marks)

### Module-2

- 3 a. Evaluate  $E_1$ ,  $E_2$ ,  $V_{12}$  and  $G_{12}$  by the rule of mixture. (12 Marks)
- b. Find the in - plane shear modulus of a glass - epoxy lamina, with a 70% fiber value fraction. The Young's modulus of fiber and matrix are 85GPa and 3.4GPa respectively. Assume Poisson's ratio of 0.2 for the fibre and 0.3 for the matrix. (04 Marks)

OR

- 4 Explain briefly the following failure theories for orthotropic materials:
- a. Maximum stress theory.
- b. Maximum strain theory.
- c. Tsa - Hill theory.
- d. Tsa - Wu theory. (16 Marks)

### Module-3

- 5 a. State the assumptions made in CLT (Classical Lamination Theory). (04 Marks)
- b. Derive [A], [B] and [D] matrices. (12 Marks)

OR

- 6 Find the three stiffness matrices [A], [B] and [D] for a three ply [0/30/-45] graphite/epoxy laminate with ply of 5mm thick. (16 Marks)

$$[\bar{Q}]_0 = \begin{bmatrix} 181.8 & 2.897 & 0 \\ 2.897 & 10.35 & 0 \\ 0 & 0 & 7.17 \end{bmatrix} \text{GPa} ; [\bar{Q}]_{30} = \begin{bmatrix} 109.4 & 32.46 & 54.19 \\ 32.46 & 23.65 & 20.05 \\ 54.19 & 20.05 & 36.74 \end{bmatrix} \text{GPa}$$

$$[\bar{Q}]_{-45} = \begin{bmatrix} 56.66 & 42.32 & -42.87 \\ 42.32 & 56.66 & -42.87 \\ -42.87 & -42.87 & 46.59 \end{bmatrix} \text{GPa.}$$

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**Module-4**

- 7 a. Explain Composite Laminates of uniform strength. (08 Marks)  
b. Explain the applications of optimal composite structures. (08 Marks)

**OR**

- 8 Briefly explain the application of composites in the field of Aircrafts, Missiles , Automobiles and Sports equipments. (16 Marks)

**Module-5**

- 9 a. Briefly explain Hand laying technique. (08 Marks)  
b. With a neat sketch, explain pultrusion technique. (08 Marks)

**OR**

- 10 Briefly explain Ultrasonic Inspection and Acoustic Emission testing. (16 Marks)

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