



Code: 13A03803

R13/SS

B.Tech IV Year II Semester (R13) Advanced Supplementary Examinations July 2018

COMPOSITE MATERIALS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

1 Answer the following: (10 X 02 = 20 Marks)

- What are the applications of composite materials?
- Differentiate between thermoplastics and thermosets.
- What is pultrusion?
- Define strain energy.
- Explain briefly about the ply architecture.
- Explain Hooke's law for a two dimensional unidirectional lamina.
- What are the assumptions made in developing stress strain relationships?
- Write the steps for analyzing a laminated composite subjected to the applied forces and moments.
- What is failure envelope?
- Explain Tsai- Hill theory.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

- Explain briefly various applications of FRP.
 - Explain briefly classification and characteristics of composite materials.

OR

- Explain particulate composites and polymer composites with examples.
 - Explain the basic terminology in fiber reinforced composite laminates.

UNIT – II

- What are the different types of fabrication methods of composites? Explain die molding.

OR

- Find the compliance and stiffness matrix for a graphite/epoxy lamina. The material properties are given as: $E_1 = 181 \text{ GPa}$, $E_2 = 10.3 \text{ GPa}$, $E_3 = 10.3 \text{ GPa}$, $\nu_{12} = 0.28$, $\nu_{23} = 0.6$, $\nu_{13} = 0.27$
 $G_{12} = 7.17 \text{ GPa}$, $G_{23} = 3.0 \text{ GPa}$, $G_{31} = 7.0 \text{ GPa}$.

UNIT – III

- Write stress – strain relations for a unidirectional lamina in terms of engineering constants referred to an arbitrary coordinate system (x, y).

OR

- Explain the basic approaches to the micromechanics of composite materials.

UNIT – IV

- Explain the following:
 - Warpage of laminates.
 - Hygrothermal effects in a laminate.

OR

- Derive the effective in-plane engineering constants for a laminate.

UNIT – V

- What are the different failure methods of composites? Explain.

OR

- Determine the first-ply failure strength of a [0/90]_s laminate under uniaxial tension or compression based on: (i) The maximum stress criterion. (ii) Tsai-Wu criterion. (Assume any missing data)

