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)

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

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

PART – B

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

UNIT – I

2 (a) Explain briefly various applications of FRP.
(b) Explain briefly classification and characteristics of composite materials.

OR

3 (a) Explain particulate composites and polymer composites with examples.
(b) Explain the basic terminology in fiber reinforced composite laminates.

UNIT – II

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

OR

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

UNIT – III

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

OR

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

UNIT – IV

8 Explain the following:

(a) Warpage of laminates.
(b) Hygrothermal effects in a laminate.

OR

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

UNIT – V

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

OR

11 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)