

CBCS SCHEME

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16/17MPD13

First Semester M.Tech. Degree Examination, Dec.2017/Jan.2018 Advanced Materials Technology

Time: 3 hrs.

Max. Marks: 80

*Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Missing data, if any, may be suitably assumed.*

Module-1

- Give a detail classification of composite materials. List the merits and demerits of composite materials. (08 Marks)
 - What are prepregs? Distinguish between fiber and particulate composite. (08 Marks)
- Using the volume fraction and mass fraction, derive the relation for estimating the density of a composite material. (05 Marks)
 - List out the assumptions made in the strength of materials approach model. (04 Marks)
 - Derive an expression for longitudinal Young's modulus. (07 Marks)

Module-2

- Derive an expression for relationship of compliance and stiffness matrix to engineering elastic constants of a lamina. (08 Marks)
 - 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 shown in Fig.Q3(b).

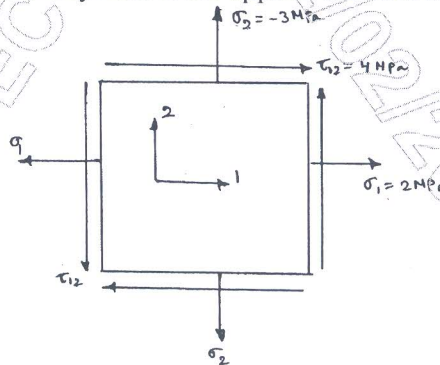


Fig.Q3(b) : Applied Stresses in a unidirectional lamina

Take $E_1 = 181$ GPa, $E_2 = 10.3$ GPa, $\nu_{12} = 0.28$; $G_{12} = 7.17$ GPa.

(08 Marks)

- Explain Hook's law for a two-dimensional angle lamina. (08 Marks)
 - Explain the brief maximum stress failure theory and maximum strain failure theory. (04 Marks)
 - Briefly explain engineering constants of an Angle lamina. (04 Marks)

Module-3

- Derive an expression of ABD matrix for laminates. (16 Marks)

- 6 Find the three stiffness matrices [A], [B] and [D] for a three ply $[0^\circ / 30^\circ / -45^\circ]$ graphite | epoxy laminate as shown in Fig.Q6. Use the unidirectional properties of graphite/epoxy. Assume each lamina has a thickness of 5 mm.

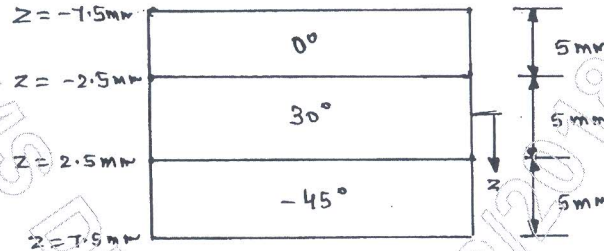


Fig.Q6 : Thickness and coordinate locations of the 3-ply laminate

Take $E_1 = 181 \text{ GPa}$ $\gamma_{12} = 0.28$.

(16 Marks)

Module-4

- 7 Sketch and explain working principle of
- Filament winding process (05 Marks)
 - Pultrusion pulforming (06 Marks)
 - Hand layup. (05 Marks)
- 8
- What is the importance of NDT? (02 Marks)
 - With a sketch explain thermoforming and injection moulding process. (10 Marks)
 - Write a note on types of defects. (04 Marks)

Module-5

- 9 Explain the composites used in the following areas:
- Aircraft and missiles
 - Space hardware
 - Marine
 - Recreational and sports equipment (16 Marks)
- 10 Explain the following :
- Reinforcement material
 - Types of MMCs
 - Characteristics & Selection of base metal
 - Applications of MMCs. (16 Marks)

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