

# CBCS SCHEME

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15AE52

## Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019 Introduction to Composite Materials

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 material and give the detailed classification. (08 Marks)  
b. Write a note on metal matrix composites and give its advantages and applications. (08 Marks)

OR

- 2 a. Explain with a neat sketch stir casting and squeeze casting process. (12 Marks)  
b. Give the applications of Al, Mg, Ti based MMC. (04 Marks)

### Module-2

- 3 Explain the following with a neat sketch :  
a. Hand layup process  
b. Filament winding. (16 Marks)

OR

- 4 Explain the following with a neat sketch :  
a. Extrusion process  
b. Injection moulding process. (16 Marks)

### Module-3

- 5 a. Determine the longitudinal Young's modulus by strength of material approach. (10 Marks)  
b. Define the following :  
i) Volume fraction  
ii) Mass fraction  
iii) Density of a composite. (06 Marks)

OR

- 6 a. Determine the global and local stresses in an angle lamina. (08 Marks)  
b. For a graphite/epoxy unidirectional lamina, find the following :  
i) Compliance matrix  
ii) Minor Poisson's ratio  
iii) Strains in the 1 - 2 co-ordinate system if the applied stresses are :  
 $\sigma_1 = 2 \text{ MPa}$ ,  $\sigma_2 = -3 \text{ MPa}$ ,  $\tau_{12} = 4 \text{ MPa}$   
[Use  $E_1 = 181 \text{ GPa}$ ,  $E_2 = 10.3 \text{ GPa}$ ,  $\nu_{12} = 0.28$ ,  $G_{12} = 7.17 \text{ GPa}$ ]. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.



Module-4

- 7 Explain the following :
- Tsai – Hill failure theory
  - Tsai – WU failure theory.

(16 Marks)

OR

- 8 Find the 3 stiffness matrices [A], [B] and [D] for a three-ply [0/30/-45] graphite/epoxy laminate as shown in Fig.Q8, use the unidirectional properties from given data of graphite/epoxy. Assume each lamina has a thickness of 5mm.

[Use :  $E_1 = 181\text{GPa}$ ,  $E_2 = 10.3\text{GPa}$ ,  $\nu_{12} = 0.28$ ,  $G_{12} = 7.17\text{GPa}$ ].

(16 Marks)

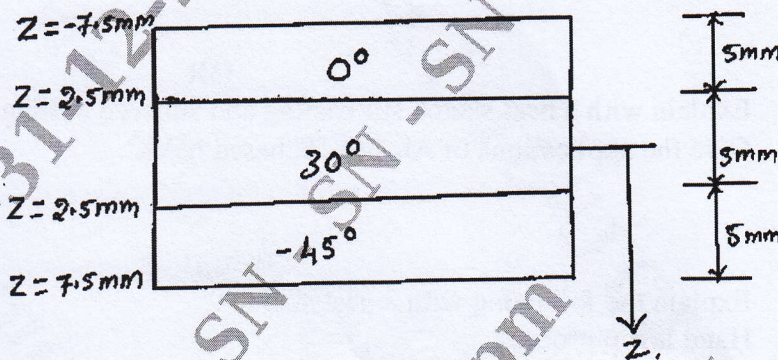


Fig.Q8

Module-5

- 9 a. Write a note on typical flaws in composite materials and classify according to stage of life cycle at which the fault occurs. (08 Marks)
- b. Explain A – B – C scan in ultrasonic testing. (08 Marks)

OR

- 10 Give the applications of composites materials in the following :
- Automobile
  - Aircrafts
  - Missiles
  - Space hardware
  - Electrical and Electronics
  - Marine
  - Sports equipment.

(16 Marks)

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