Total No. of Printed Pages: 2

PRN No.	

PAPER CODE	U315-2334B (ESE)

(AY:2025-26) December 2025 (ENDSEM) EXAM

TY (SEMESTER - I)

COURSE NAME: COMPOSITE MATERIALS **BRANCH:** MECHANICAL **COURSE CODE:** ME31234B

T.Y.B.Tech (PATTERN 2023)

Time: [1Hr 30 Min] **[Max. Marks: 40]**

(*) Instructions to candidates:

1) **Figures to the right indicate full marks. Use of scientific calculator is allowed**
2) **Use suitable data wherever required**
3) **All questions are compulsory. Solve any two sub question each from Questions 1 and 2**
4) **Solve any one sub question (2 marks) from Questions 3 ,4 ,5 and 6 and sub question of 4 marks is compulsory from questions 3,4,5,and 6**

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) Differentiate between alloys and fiber reinforced composite materials.	[4]	1	2
	b) Define the terms- Filament, Yarns, Lamina, Laminate, Micromechanics and Macro-mechanics.	[4]	1	2
	c) Illustrate the role of the matrix in fiber-reinforced composite materials and explain the different types of polymer matrices used.	[4]	1	2
Q2	a) Demonstrate the filament winding process, draw neat sketch and list down examples of products manufactured using this technique.	[4]	2	2
	b) Identify the different types of manufacturing processes and list the types of products produced by each process.	[4]	2	2
	c) Explain with neat sketch VRTM process and its applications.	[4]	2	2
Q3	a) Specify the ASTM standard, specimen dimensions, and test speed required for conducting the following quasi-static tests on UTM: i) Tensile Test, and ii) Compression Test	[2]	3	2
	OR			
	b) Specify the ASTM standard, specimen dimensions, and test speed required for conducting the following quasi-static tests on UTM: i) Flexural Test, and ii) In-plane shear Test	[2]	3	2
	c) Compare the 3-point bending and 4-point bending tests, and state the suitability of each for specific types of composite materials, including the reasons for their suitability.	[4]	3	2

Q4	a) Obtain the expression for longitudinal Youngs modulus in terms of volume fraction of fiber and matrix using strength of material approach (ROM) OR b) Obtain the expression for in-plane shear modulus in terms of volume fraction of fiber and matrix using strength of material approach. c) In unidirectional carbon fiber reinforced epoxy composite, carbon fiber is 55% by volume. Evaluate longitudinal modulus, tensile strength and fraction of load carried by fibers in composite ? Use following constituent properties. $E_f = 250GPa, \sigma_f = 4.5GPa, E_m = 2.5\ GPa, \sigma_m = 110\ MPa$	[2] [2] [4]	4 4 4	3 3 3
Q.5	a) Identify the tensor order for stress, strain, and elastic constants, and provide a justification based on their mathematical representation. OR b) Obtain the relationships for coefficients of transformed compliance matrix $[\bar{S}]$ for angle ply lamina in terms of coefficients of [S]. c) Estimate the compliance matrix [S] for an orthotropic lamina, engineering constants along the principal material axes are E_1=150GPa, E_2=20GPa, G_{12}=5 GPa, ν_{12} =0.2.	[2] [2] [4]	5 5 5	3 3 3
Q.6	a) Demonstrate with suitable example how laminate code designation is applied? OR b) Apply CLT to formulate the equation for cross-ply laminate and identify which coefficients in the A, B, and D matrices will be zero, explaining their significance in the context of laminate behavior. c) Find [A] matrix for a three-ply $[0/\overline{90}]s$ laminate. Transformed reduced stiffness matrix for 0^0 and 90^0 are given below. Each lamina is 0.002 thick. $[\bar{Q}]_0 = \begin{bmatrix} 18 & 2 & 0 \\ 2 & 10 & 0 \\ 0 & 0 & 7 \end{bmatrix}$ $[\bar{Q}]_{90} = \begin{bmatrix} 10 & 2 & 0 \\ 2 & 18 & 0 \\ 0 & 0 & 7 \end{bmatrix}$	[2] [2] [4]	6 6 6	3 3 3

Note: [BT Level: 1- Remember; 2-Understand; 3-Apply; 4-Analyse; 5-Evaluate; 6- Create]