U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VI**

Branch: Aerospace Engineering **Duration: 3 hrs.**

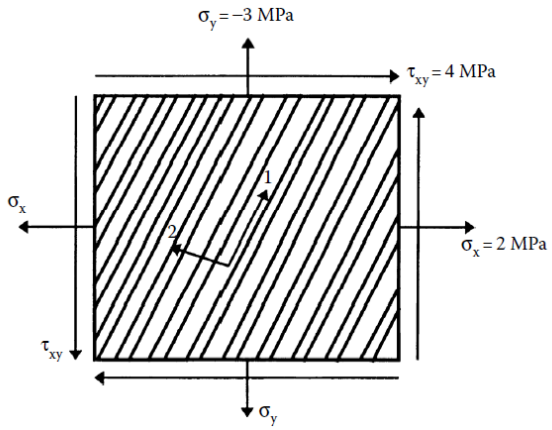
Course Code: 23AS6PCMCM/ 22AS6PECMT /20AE6DCCMT **Max Marks: 100**

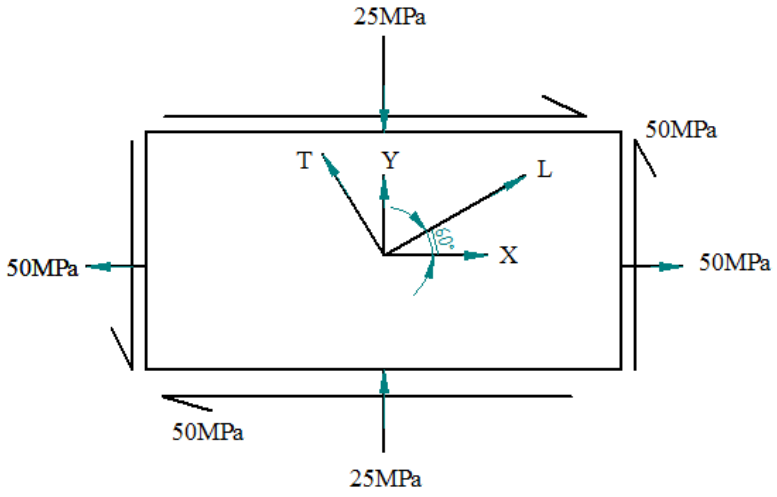
Course: Mechanics of Composites Materials / Composites Materials

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

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		Illustrate the classification of composite.	CO1	PO1	04
	b)		Explain the characteristics of laminated composites & particulate composites.	CO	PO1	06
	c)		Analyse the principle of pultrusion process with a neat diagram along with its advantages.	CO	PO	10
			OR			
2	a)		Explain the future potential of composite.	CO	PO	6
	b)		Illustrate about the layup and curing process.	CO	PO	6
	c)		Draw and explain the principle of injection moulding process.	CO	PO	8
			UNIT - II			
3	a)		Derive an expression for Major Poisson's ratio.	CO	PO	10
	b)		Examine the in-plane shear modulus, longitudinal elastic modulus, transverse elastic modulus, major and minor Poission's ratio of glass/epoxy lamina with a 70% fiber volume fraction. Use the properties of glass and epoxy. Given,E_f=85GPa, E_m=3.4 GPa, ν_f =0.2,ν_m =0.3.	CO	PO	10
			OR			
4	a)		Derive an expression for in-plane shear modulus.	CO	PO	08
	b)		Investigate the compliance and stiffness matrix for graphite/epoxy lamina taking the following properties E_1=181GPa, E_2=10.3GPa, E_3=10.3GPa υ_{12}=0.25, υ_{23}=0.60, υ_{13}=0.27 G_{12}=7.17GPa, G_{23}=3.0GPa, G_{31}=7.00GPa. ($\sigma_1 = 2MPa$, $\sigma_2 = -3MPa$, $\tau_{12} = 4MPa$.)	CO	PO	12

			UNIT - III			
	5	a)	Write down the elements of reduced compliance matrix of 2D orthotropic lamina stating the assumptions in evolving this matrix. Derive expressions for the reduced compliance coefficients in terms of engineering constants.	***CO***	***PO***	**10**
		b)	Formulate the relation between the strain-stress equation for an angle lamina in terms of engineering constant.	***CO***	***PO***	**10**
			OR			
	6	a)	Write For a graphite/epoxy unidirectional lamina, find i) reduced stiffness matrix and ii) transformed reduced stiffness marix for 60^0 angle lamina.E_1 = 181 GPa, E_2 = 10.3 GPa, V_{12} = 0.28 and G_{12} = 7.17 GPa.  Figure 6a	***CO***	***PO***	**10**
		b)	Write down the elements of reduced compliance matrix of an angle lamina stating the assumptions in evolving this matrix. Derive expressions for the reduced compliance coefficients in terms of elastic constants of the lamina.	***CO***	***PO***	**10**
			UNIT - IV			
	7	a)	Develop equation for Tsai-Hill Failure theory.	***CO***	***PO***	**10**
		b)	Predict the life of the graphite /epoxy lamina. By maximum strain theory.($\Theta=60^0$). (σ_1^T)ult = 1062 MPa, (σ_1^C)ult = 610 MPa,(σ_2^T)ult = 31 MPa (σ_2^C)ult = 118 MPa,(τ_{12})ult = 72 MPa, E_1 = 38.6 GPa; E_2 = 8.27 GPa; G_{12} = 4.14 GPa; V_{12} = 0.26	***CO***	***PO***	**10**

			 Figure 7b: Applied stress in a lamina			
			OR			
	8	a)	Explain maximum stress failure theory.	***CO***	***PO***	**05**
		b)	Estimate the maximum values of S > 0 if stress σ_x = 2S, σ_y = -3S and τ_{xy} = 4S is applied to a 60^o graphite/epoxy lamina. Use Tsai-Wu failure theory and the properties of graphite/epoxy unidirectional lamina	***CO***	***PO***	**10**
		c)	Explain maximum strain failure theory.	***CO***	***PO***	**05**
			UNIT - V			
	9	a)	Derive A, B & D matrix of a laminate.	***CO***	***PO***	**18**
		b)	Explain about cross ply laminate.	***CO***	***PO***	**02**
			OR			
	10	a)	Explain the coding of laminates with multiple isotropic layers.	***CO***	***PO***	**06**
		b)	Write the assumptions of Classical lamination theory (CLT) and derive the stress-strain relations for a classical laminate and represent the stress-strain variation in a laminate.	***CO***	***PO***	**14**

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