CBCS SCHEME

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BAE601

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026
Composite Materials and Structures

ACHARYA INSTITUTE OF TECHNOLOGY LIBRARY BANGALORE

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Outline the classification of composite materials based on reinforcement and matrix.	10	L1	CO1
	b.	Derive the expression for strain stress relations for orthotropic materials. State the number of independent elastic constants in orthotropic materials.	10	L4	CO1
		OR			
Q.2	a.	Derive the expression for stress-strain relations for isotropic materials. State the number of independent elastic constants in isotropic materials.	10	L4	CO1
	b.	Explain the applications of composite materials in the construction of various civil aircrafts.	10	L1	CO1
		Module – 2			
Q.3	a.	Determine the density of the glass epoxy of lamina with a 70% fiber volume fraction, $\rho_f = 2500$ kg/m^3, $\rho_m = 1200$ kg/m^3. Determine the mass fraction of the fiber and matrix.	10	L3	CO2
	b.	Derive the expression to determine the longitudinal Young's Modulus (E_1) for unidirectionally fiber reinforced composite material.	10	L4	CO2
		OR			
Q.4	a.	Find the longitudinal Young's modulus for a glass/epoxy lamina with 70% fiber volume fraction. Use the properties for glass and epoxy $E_f = 85$ GPa, $v_f = 0.2$, $E_m = 3.4$ GPa, $v_m = 0.3$. Use equations obtained from elasticity model.	10	L3	CO2
	b.	Derive the stress-strain relation for plane stress in an orthotropic material.	10	L4	CO2

		Module – 3			
Q.5	**a.**	Explain the construction, properties and applications of angle ply laminates in aerospace structures.	**10**	**L3**	**CO3**
	b.	Discuss how stacking sequence can be tailored to design different composite laminates.	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	Explain T-Sai Hill theory used for anisotopic materials.	**10**	**L3**	**CO3**
	b.	Describe maximum stress failure criterion for failure analysis of composites. State the stress components along the principle material axis in off axis loading of a unidirectional lamina.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain Sandwich structure in composite materials and discuss the construction and their application in aerospace.	**10**	**L2**	**CO4**
	b.	Enumerate the basic design principles for sandwich structures in composite materials.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Briefly describe common failure modes observed in sandwich structures and the primary mechanism that cause them.	**10**	**L2**	**CO4**
	b.	Describe the method to determine the following mechanical properties of a sandwich panel. i) Core density ii) Shear strength of honey comb.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	With a neat illustration describe the preparation of fiber reinforced laminates by hand layup.	**10**	**L2**	**CO5**
	b.	Explain the Vacuum Bagging process. Apply their knowledge to describe its use in aerospace fabrication through a labelled sketch.	**10**	**L1**	**CO5**
		OR			
Q.10	**a.**	Discuss the process parameters and mechanism of injection moulding of thermoset composite, with a neat diagram.	**10**	**L2**	**CO5**
	b.	Write the following fabrication process with understanding to real world applications. i) Filament winding ii) Pultrusion.	**10**	**L1**	**CO5**

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