Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 170103 **Date: 04/05/2017**

Subject Name: Mechanics of Composite Materials

Time: 02:30 PM to 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	What do you understand by mechanical behavior of composite materials?	**07**
	(b)	Explain strength and stiffness of composite materials and metals with comparison.	**07**
Q.2	**(a)**	Explain a unidirectional lamina and a laminate. Draw the deformation pattern of unidirectional lamina with fibres oriented at 0 degrees and compare it with a unidirectional lamina having fibres oriented 45 degrees.	**07**
	(b)	What are the uses of composite materials? Mention their advantages and disadvantages	**07**
		OR	
	(b)	Define: Ply, Principal axis, Reference axis, In-plane stress, On-axis system, Orthotropic material, Transversely isotropic material.	**07**
Q.3	**(a)**	Derive strain-displacement relationship in detail and also explain the significance of each term with a neat sketch	**07**
	(b)	Mention the range of E1, E2 and v12, normally found in uni-directional plies. Plot the variation of Young's modulus, Shear modulus and Poisson's ratio w.r.t the orientation angle. "Give definite reasons" for this pattern of variation.	**07**
		OR	
Q.3	**(a)**	A uni-directional lamina is subjected to stresses as follows σ_1=500 MPa, σ_2=80 MPa and σ_6=25 MPa. E= 100 kN/mm2 and ν = 0.25. Determine reduced stiffness, reduced compliance matrix and the strain components.	**07**
	(b)	Write a note on constituents of fibre reinforced composite materials.	**07**
Q.4	**(a)**	Write a short note on symmetric and anti-symmetric laminates with example.	**07**
	(b)	What are stress resultants? Explain the importance and use of stress resultants in laminates and also explain the stress and strain behavior across the laminates.	**07**
		OR	
Q.4	**(a)**	Explain Maximum Stress theory	**07**
	(b)	Describe coupling and the advantages-disadvantages of coupling. Also mention the applications of coupling.	**07**
Q.5	**(a)**	Write the types of local failure modes at micro-level. Explain longitudinal tension.	**07**
	(b)	Describe [A], [B] and [D] matrices and explain its importance	**07**
		OR	
Q.5	**(a)**	Describe a failure envelope and also explain different types of failure criteria.	**07**
	(b)	Explain in detail volume and weight fractions and write a short note on derivation of transverse modulus	**07**

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