Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – WINTER 2013

Subject Code: 170103 Date: 07-12-2013

Subject Name: Mechanics of Composite Materials

Time: 10:30 TO 01:00 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)**	Explain isotropic, orthotropic and transversely isotropic materials. How many planes of symmetry do they have? Also mention the number of independent constants required to classify these materials.	**07**
	(b)	Define composite materials. How many types of composite materials are there? Classify and explain.	**07**
Q.2	**(a)**	(i) Explain on-axis and off-axis system and draw the necessary diagrams.	**04**
		(ii) When do you need transformation? Explain the transformation matrix.	**03**
	(b)	Explain the importance of [A], [B] and [D] matrices. Describe them in detail.	**07**
		OR	
	(b)	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**
Q.3	**(a)**	Write down stress-strain relationships of a thin lamina.	**07**
	(b)	Classify symmetric laminates and anti-symmetric laminates. Give suitable examples.	**07**
		OR	
Q.3	**(a)**	(i) Explain a lamina and a laminate	**03**
		(ii) Prove for a regular anti-symmetric laminate that Axs, Ays,Dxs and Dys = 0	**04**
	(b)	Draw the variation of Young's Modulus with orientation angle 'θ' for Ex and Ey. Also draw the variation of shear modulus with 'θ'. Explain the reason behind such a variation.	**07**
Q.4	**(a)**	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**
	(b)	Describe coupling and the advantages-disadvantages of coupling. Also mention the applications of coupling.	**07**
		OR	
Q.4	**(a)**	Derive Poission's ratio and shear modulus for a unidirectional laminate.	**07**
	(b)	Mention advantages and disadvantages of composite materials and all its applications in the industry.	**07**
Q.5	**(a)**	Derive the longitudinal strength of a unidirectional laminate under tension	**07**
	(b)	Write a short note on volume and weight fraction and also mention the need of this kind of method in the industry.	**07**
		OR	
Q.5	**(a)**	Explain failure theories used for composite materials	**07**
	(b)	Write all the assumptions used for the analysis of laminated composites. Define middle plane and explain its significance.	**04** **03**

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