

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII EXAMINATION – SUMMER 2016****Subject Code:170103****Date:10/05/2016****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) Explain isotropic, orthotropic and a transversely isotropic materials. How many planes of symmetry do they have? Also mention the number of independent constants required to classify all these three materials. **07**
- (b) Define and list the advantages and disadvantages of composite materials. What is the importance of composite materials in aircraft industry? Justify its use. **07**
- Q.2** (a) Explain On-axis and Off-axis system with relevant sketches and labeling. Explain the importance of the process of transformation. Explain the relationship between the stresses in material axes and reference axes. Derive the relationship between reduced stiffness matrix in material axes and reference axes. **07**
- (b) Describe the stress-strain relations for plane stress in an orthotropic material. **07**
- OR**
- (b) Describe [A], [B] and [D] matrices and explain its importance. **07**
- Q.3** (a) Derive transverse modulus for a uni-directional composite. **07**
- (b) Write a short note on unsymmetric and anti-symmetric laminates. **07**
- OR**
- Q.3** (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) Derive the longitudinal strength of a unidirectional laminate under tension **07**
- Q.4** (a) Derive inplane-shear modulus and Poisson's ratio for a uni-directional composite **07**
- (b) Write in detail the classification of types of laminates **07**
- OR**
- Q.4** (a) List down all the assumptions used for the analysis of laminated composites. Explain the significance of middle plane. **07**
- (b) Sketch neatly the variation of stress, strain and displacement over the thickness of the laminate. "List" the stress-strain and strain-displacement relationships. **07**
- Q.5** (a) Explain strain-displacement relationship of a laminate. Draw relevant sketches. **07**
- (b) Sketch the variation of Young's modulus: E_x and E_y with θ and explain the reason of variation. **07**
- OR**
- Q.5** (a) 1. Define stiffness and compliance matrices. **07**
2. Explain Maximum Stress theory
- (b) Explain in detail volume and weight fractions and write a short note on derivation of transverse modulus **07**
