Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) • EXAMINATION – WINTER 2016

Subject Code:2170103 Date:23/11/2016

Subject Name:Mechanics of Composite Materials

Time:10.30 AM to 1.00 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 in great detail along with diagrams the behavior of stress, strain, displacement and modulus over the laminate. Also mention the necessary equations. **07**

(b) Define equilibrium equations and derive the force and moment resultants. Discuss their significance. **07**

Q.2 **(a)** Describe the stress-strain relations for plane stress in an orthotropic material. **07**

(b) Explain in detail A, B and D matrices, its derivation and significance. **07**

OR

(b) Write in detail the importance of stacking sequence in a laminate considering all angles. **07**

Q.3 **(a)** Derive Strain-Displacement relationship of a laminate along with a neat sketch stating all the necessary assumptions. **07**

(b) Explain the importance of composite materials in today's world. Also mention the disadvantages and advantages as compared to other materials. **07**

OR

Q.3 **(a)** Derive equations for volume and weight fractions. **07**

(b) Plot the variation of Elastic and shear modulus with the ply angle. Determine the equivalent stress system in 1-2 direction, for a lamina with ply angle of 30^0. If stresses along the reference axes are σx=180 GPa, σy=35 GPa, σs=40 GPa **07**

Q.4 **(a)** Discuss in detail anti-symmetric laminates **07**

(b) Identify the type of laminate given below: **07**

1. [90|0]
2. [45|0|-45]
3. ['±30]
4. [0|90|0|90]
5. $[60|0_2|60]$
6. [20|45|-20|-45]
7. $[0|90]_S$

OR

Q.4 **(a)** Discuss in detail symmetric laminates **07**

(b) What do you mean by tailoring of FRC? Compute [A] matrix for a [90|0] laminate **07**

Q.5 **(a)** Compute [B] and [D] matrix for a [60|-60] laminate **07**

(b) Derive and explain the transverse modulus of a lamina and also plot the variation of the transverse modulus with the fibre content. **07**

OR

Q.5 **(a)** A unidirectional fibre reinforced composite contains 55 % by volume of fibres. Given E_{1f}=300GPa, σ_{1f}=5.6GPa, Em=3.5GPa, σ_m=100MPa. Evaluate the longitudinal tensile modulus and strength of this FRC. **07**

(b) Write short notes on: **07**

1. The need of transformation
2. Reduced Stiffness matrix and the process of its existence

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