Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: 170103 Date: 01/01/2013

Subject Name: Mechanics of Composite Materials

Time: 10.30 am - 01.00 pm Total Marks: 70

Instructions:

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

Q.1 **(a)** Describe classification of composite materials. Explain in detail various types with suitable examples **07**

(b) Describe and explain the strength and stiffness of composite materials and metals. Show the comparison also. **07**

Q.2 **(a)** Define and explain a lamina and laminate with sketches **07**

(b) Explain in detail and with sketches the mechanical behavior of isotropic, orthotropic and anisotropic materials. **OR** **07**

(b) Describe and cite the applications of composites and their use in different industries **07**

Q.3 **(a)** Describe micromechanical behavior of a composite lamina in detail **07**

(b) Describe anisotropic, monoclinic, orthotropic and transversely isotropic materials **07**

OR

Q.3 **(a)** Describe the stress strain relations for plane stress in an orthotropic material **07**

(b) Describe the macro mechanical behavior of a composite lamina in detail **07**

Q.4 **(a)** Explain in detail symmetric laminates with two example **07**

(b) Write a short note on unsymmetric and anti-symmetric laminates with two example **07**

OR

Q.4 **(a)** Derive transformation of stress-strain relations for a lamina with arbitrary orientation **07**

Q.4 **(b)** Describe [A], [B] and [D] matrices and explain its importance **07**

Q.5 **(a)** A two ply aluminum and steel plate having a thickness of 1 inch is stacked together $E_{aluminum} = 10*10^6$ psi, $\nu = 0.33$ and $E_{steel} = 29*10^6$ psi, $\nu = 0.28$. Find [A], [B] and [D] matrices **07**

(b) Derive inplane-shear modulus and Poisson's ratio for a uni-directional composite **07**

OR

Q.5 **(a)** Derive transverse modulus for a uni-directional composite **07**

(b) For a two ply Boron epoxy laminate of $0^0_{(0.1\ inch)}/45^0_{(0.2\ inch)}$ find out the [A] matrix **07**

Given: $[Q] = \begin{matrix} 30 & 1 & 0 \\ 1 & 3 & 0 \\ 0 & 0 & 1 \end{matrix} * 10^6$ psi

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