

Code No: RT41215

R13**Set No. 1**

IV B.Tech I Semester Supplementary Examinations, February - 2019

ANALYSIS OF COMPOSITE STRUCTURE

(Aeronautical Engineering)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part-A and Part-B**Answer ALL sub questions from Part-A**Answer any THREE questions from Part-B*

PART-A (22 Marks)

1. a) Mention the assumptions made in modified Netting analysis? [3]
- b) Derive the number of elastic constants for the following materials: [4]
(i) Anisotropic (ii) Orthotropic
- c) Distinguish between mechanics of materials approach and elasticity approach? [4]
- d) What is macro mechanics? Distinguish between natural axis and arbitrary axis. [3]
- e) Distinguish between symmetric cross ply laminate and symmetric angle ply laminate. [4]
- f) Give advantages of the maximum stress failure theory over the Tsai-Wu failure theory. [4]

PART-B (3x16 = 48 Marks)

2. a) What will you conclude if for determination of E_2 , equal strains in the fiber and matrix are assumed instead of equal stresses? [8]
- b) The weight of the matrix is measured to be 35% of the weight of the composite. What is the fiber volume fraction? The specific gravities of glass and epoxy are 2.58 and 1.22 respectively. [8]
3. a) Show that an orthotropic material whose principal stiffnesses satisfy the following relations is isotropic $Q_{11}=Q_{22}$ and $Q_{66} = \frac{1}{2}(Q_{11}-Q_{12})$. [8]
- b) Obtain Poisson's ratio for an off axis unidirectional composite at an angle $\theta = 60^\circ$ to the fiber direction for a material with $E_1 = 15E_2=22.5G_{12}$ and $\nu_{12} = 0.30$. [8]
4. a) Derive the longitudinal, transverse and shear modulus of composites using strength of material approach. [8]
- b) Explain in detail the elasticity approach of FRP laminated composites. [8]
5. Explain the following [16]
(a) Transformation of geometric axes
(b) Biaxial strength theories.
6. a) What is an angle ply lamina? What are its specific features? [8]
- b) List out the assumptions followed in the derivation of classical lamination theory? Write the procedure for deflection analysis of laminated plates. [8]
7. a) Reduce the Tsai-Wu failure theory for an isotropic material with equal ultimate tensile and compressive strengths and a shear strength that is 40% of the ultimate tensile strength. [8]
- b) Discuss about buckling of rectangular laminated plates. [8]