Registration no: | | | | | | | | | | |

Total Number of Pages: 1 **MTECH**
CEPE203

2nd Semester M Tech Regular /Back Examination – 2014-15
COMPOSITE STRUCTURES
BRANCH(S): STRUCTURAL AND FOUNDATION ENGINEERING
Time: 3 Hours Max. marks: 70
Q.CODE: T280

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions briefly. (2 x 10)

a) Distinguish between the properties, *homogeneity* and *isotropy*.
b) State the aircraft and space applications of composites.
c) What do you mean by a *specially orthotropic lamina* ?
d) Classify various types of materials based on number of independent elastic constants.
e) What do you mean by hybrid composites? Give an example.
f) Distinguish between *micromechanics* and *macromechanics.*
g) What is the role of transformation matrix $[T]$ in composite mechanics?
h) State the formula for *transverse modulus* of a composite as per *rule of mixture*.
i) Distinguish between *symmetric* and *antisymmetric* laminates.
j) What do you mean by the term, *stacking sequence*?

Q2 a) In composite mechanics, prove that, $[T^{-1}] = [T(-\vartheta)]$. (6)

b) Explain if the laws of stress and strain transformation are independent of material properties. (4)

Q3 a) Derive the mathematical equations for *stress- strain* and *strain- stress* relationship for a *specially orthotropic material.* (6)

b) What are the important observations in the above relationship? (4)

Q4 For a FRP composite of unidirectional lamina with fibre orientation of 30 degree, calculate the *compliance matrix* , *stiffness matrix* and *transformed reduced stiffness matrix* if E_{11}= 130 GPa,E_{22} = 8 GPa, G_{12} = 7 GPa, and ν_{12} =0.3. (10)

Q5 For a 90/0/90 laminate subjected to thrust N_x = 150 MPa-mm, find the resultant stresses along the reference axis for each lamina. E_1 = 125 GPa, E_2 = 10 GPa, E_6 = 8 GPa , thickness of each layer is 0.5 mm, ν_{12} = 0.3. (10)

Q6 (a) Calculate the A and D matrix for a three layered [45/0/45] laminate if E_1 = 125 GPa, E_2 = 9 GPa, E_6 = 6 GPa, ν_{12} = 0.32 and total thickness of the laminate is 1.5 mm. (5)

(b) Find the *bending-extension coupling stiffness matrix* for a symmetric laminate of 3 layers. (5)

Q7 a) State the assumptions of Classical Laminated Plate Theory. (4)

b) Develop the moment equilibrium equations for laminated plates. (6)

Q8 Write short notes on any **two** of the followings. (5 x 2)

a) thermoplastic and thermoset
b) reduced stiffness matrix
c) bending-extension coupling stiffness matrix
d) shear coupling coefficients