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

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M.TECH
CEPE203

2nd Sem Regular / Back Examination – 2015-16
COMPOSITE STRUCTURES
Q.CODE:W776
Time: 3 Hours
Max marks: 70

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: (2 x 10)

a) Can concrete and mortar be termed as composite materials? Explain.
b) What do you mean by *particulate composite*?
c) In *ceramic matrix composite* category, state specific type of fibres and matrix used.
d) Distinguish between *thermo plastic* and *thermoset*.
e) Give an example of a *regular angle-ply laminate*.
f) State, whether the total no of plys in an antisymmetric laminate is an odd no or even no.
g) Draw the stress distribution diagram along the thickness of a symmetric angle ply laminate under flexure.
h) What do you mean by stacking sequence? Give one example.
i) State three applications of composite materials in different service sectors.
j) In a composite material, define the following elastic modulus values. $E_{11,}$ E_{22} , G_{12} , $G_{23.}$

Q2 Define *weight fraction* and *volume fraction* for matrix and for fibre. In micromechanical analysis, derive the formula for the inplane shear modulus of a composite as a function of the corresponding shear modulus of fibre and the matrix. (3+7)

Q3 For a FRP composite of unidirectional lamina with fibre orientation of 45 degree, calculate the compliance matrix , stiffness matrix and transformed reduced stiffness matrix if E_{11}= 130 GPa, E_{22} = 8 GPa, G_{12} = 7.0 GPa, and ν_{12} = 0.32. (10)

Q4 Explain the difference between *principal material axis system* and *reference axis system* with neat sketches for each one. Why is it required for transformation of stresses and strains from one axis system to another? Derive the *transformation matrix, T* wrt stress when transformed from principal material axis, 1-2 to the reference axis x-y. (2+2+6)

Q5 For a 0/90/0 symmetric laminate subjected to N_x = 120 MPa-mm thrust, calculate the resultant stresses along the reference axis for each lamina. E_1 = 135 GPa, E_2 = 10 GPa, E_6 = 5 GPa, thickness of each layer is 0.1 mm, ν_{12} = 0.3. (10)

Q6 Calculate the A and B matrix for a three layered [0/45/0] laminate if E_1 = 125 GPa, E_2 = 8 GPa, E_6 = 5 GPa, ν_{12} = 0.35 and total thickness of the laminate is 1.5 mm. (10)

Q7 Derive Navier's solution for finding deflection at centre of a square orthotropic laminate with all edges simply supported. (10)

Q8 Write short notes on any two: (5 x 2)

a) Assumptions in micromechanical analysis of composites
b) Mathematical constant and engineering constant
c) Isotropy and anisotropy
d) Coupling effects