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Total Number of Pages: 02

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.**

- 109
- 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 plies 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} .
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- 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)
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- 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 $\nu_{12} = 0.32$. (10)
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- 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, $\nu_{12} = 0.3$. (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, $\nu_{12} = 0.35$ 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