**Reg. No. :** | | | | | | | | | | |

**Question Paper Code: 52605**

M.E. DEGREE EXAMINATION, MAY 2017

Elective

Structural Engineering

15PSE506 - MECHANICS OF COMPOSITE MATERIALS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 20 = 100 Marks)

1. (a) (i) Derive the rule of mixture for calculating Young's Modulus of an aligned fiber reinforced composite loaded parallel to the direction of fiber orientation. (9)

(ii) Briefly explain the pultrusion process with diagram. (9)

(iii) What is the role of matrix I composites? (2)

Or

(b) (i) Briefly explain the different types of fibers used in composites. (18)

(ii) How are composite materials classified? (2)

2. (a) Briefly explain the following:

(i) Angle ply laminates (9)

(ii) Balanced laminates (9)

(iii) What do you mean by interlaminar stresses? (2)

Or

(b) (i) A uniaxial load is applied to a $10^0$ ply. The linear stress-strain curve along the line of load is related as $\sigma_x = 123\varepsilon_x$, where the stress is measured in GPa and strain in m/m. Given $E_1 = 180GPa$, $E_2 = 10GPa$ and $v_{12} = 0.25$. Find the value

(1) Shear modulus, $G_{12}$ and (9)

(2) Modulus $E_x$ for a $60^0$ ply (9)

(ii) What do you mean by quasi-isotropic laminates? (2)

3. (a) (i) A composite consists of 40% of Volume fibres of diameter 100 microns. If the strength of fiber is 3GPa, that of the matrix is 80MPa and the interfacial steam strength is 60MPa. Determine the composite fracture strength for filament length at

(1) 100 micron (9)

(2) 2mm (9)

(ii) Write the basic assumptions in Von Mises Yield criterion for isotropic materials. (2)

Or

(b) Discuss in detail about the following:

(i) Anisotropic plate (8)

(ii) Orthotropic plates (8)

(iii) Interlaminar stresses (4)

4. (a) (i) Discuss in detail about CTE's for unidirectional and off-axis laminates. (16)

(ii) Write the short notes on sandwich construction. (4)

Or

(b) (i) Briefly explain the thermally quasi isotropic laminates. (18)

(ii) What are different types of failure criterion? (2)

5. (a) (i) Explain the free vibration of laminated composite plates subjected to a thermal loading with general boundary conditions. (18)

(ii) What is meant by zero CTE laminates? (2)

Or

(b) (i) Distinguish between cross ply laminates and symmetric laminates. (9)

(ii) What are factors affecting the laminate selection for fibre reinforced polymer? (9)

(iii) How does the static bending analysis of cross ply laminates differ from others? (2)

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