III-SEM-MECH/AUTO/AERONAUTICS/DIP.MECH/MECH(PT)/MECH(PROD)/ MECH(MNTN)/MECH(INDUS)/2019(W)/(NEW)

Th. 2 - STRENGTH OF MATERIAL

Full marks – 80 **Time – 3 Hours**

Answer any five question including Q NO. 1 & 2

Figures in the right hand margin indicate marks.

1. Answer ALL the Questions. (2x10)

(a) What is difference between stress & strain?

(b) State the Hooke's law.

(c) What is meant by modulus of rigidity?

(d) Define hoop stress.

(e) What is volumetric strain?

(f) What is resilience?

(g) Define section modulus.

(h) Define point of contra-flexure.

(i) Define shear force & bending moment.

(j) What is polar moment of inertia?

2. Answer any SIX Questions. (5x6)

(a) A steel bar 2 m long & 150 mm² in cross section is subjected to an axial pull of 15 KN. Find the elongation of the bar. Take E=200GPa.

(b) A cylindrical shell 2 m long & 1 m internal diameter is made up of 20 mm thick plates. Find the circumferential & longitudinal stress in the shell material, if it is subjected to an internal pressure of 5 MPa.

(c) A simply supported beam of 6m span carries a point load of 50 KN at a distance of 5m from its left end. Draw S.F & B.M diagram for the beam.

(d) State the assumptions made in theory of simple bending.

(e) What is meant by eccentric loading? Explain its effects on a short column.

(f) Define Principal Planes & Principal Stresses. Explain their uses.

(g) Derive the relationship between Young's Modulus of Elasticity & Bulk Modulus.

3. A solid circular shaft of 80 mm diameter is transmitting power at 120 rpm. If the shear stress is not to exceed 40 MPa, find the power transmitted by the shaft. (10)

4. At a point in a strained material, the principal stresses are 100 MPa & 50 MPa both tensile. Find the normal & shear stresses at a section inclined at 60° with the axis of the major principal stresses. (10)

5. A beam 3 m long has rectangular section of 80 mm width & 120 mm depth. If the beam is carrying a uniformly distributed load of 10 KN/m. Find the maximum bending stress developed in the beam. (10)

6. A rectangular body 400 mm long, 100 mm wide & 50 mm thick is subjected to a shear stress of 60 MPa. Determine the strain energy stored in the body. Take modulus of rigidity =80 N/mm ^{2}. (10)

7. A simply supported beam of 6 m span is carrying loads as shown in the figure. Draw the shear force & bending moment diagrams for the beam. (10)