Th-2 Strength of Material

Full Marks: 80   Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1.   Answer **All** questions   2 x 10

   a.   Define Poisson's ratio.
   b.   What is meant by Shear force diagram and Bending moment diagram?
   c.   Define the point of contra-flexure.
   d.   Define column.
   e.   What is meant by Temperature stress?
   f.   What do you mean by Section modulus?
   g.   Define Principal Stress and Principal Plane.
   h.   What is the function of shaft? Write down the formula for power transmitted by a shaft.
   i.   Define cantilever beam with example.
   j.   What is meant by thin cylinder shell? State its application.

2.   **Answer Any Six** Questions   6 x 5

   a.   A hollow cylinder 2m long has an outside diameter of 50mm and inside diameter of 30mm. If the cylinder is carrying a load of 25kN, find the stress in the cylinder. Also find the deformation of the cylinder, if the modulus of elasticity for the cylinder material is 100GPa.

   b.   The stresses at point of a machine component are 150MPa and 50MPa both tensile. Find the intensities of normal, shear and resultant stresses on a plane inclined at an angle of 55^0 with the axis of major tensile stress.

   c.   Show diagrammatically different types of beams and loads.

   d.   What are the various assumptions taken while deriving bending equations under theory of simple bending?

   e.   Derive a formula for the longitudinal stress in a thin cylindrical shell subjected to an internal pressure.

   f.   Write down the assumption taken for finding out the torsion formula.

   g.   A solid circular shaft of 100mm diameter is transmitting 120kW at 150 rpm. Find the intensity of shear stress in the shaft.

3   Prove

    $E= 3k(1-2/m)$

    Where E= Young's modulus

        K= Bulk modulus

        1/m= Poisson's ratio

4   Prove the relation

    $m/l=\sigma/y=E/R$

    where m= Bending moment

        I= Moment of inertia

        σ= Bending stress in a fibre at a **distance** y from the neutral axis

        . E= young's modulus

        R= Radius of curvature

5   A cantilever beam AB, 2m long carries a uniformly distributed load of 1.5kN/m   10
    over a length of 1.6m from the free end. Draw the shear force diagram and
    bending moment diagram for the beam.

6   A cylindrical shell of 1.3m diameter is made up of 18mm thick plates. Find the   10
    circumferential and longitudinal stress in the plates, if the boiler is subjected to
    an internal pressure of 2.4MPa. Take efficiency of the joints as 70%.

7   A rectangular beam 60mm wide and 150mm deep is simply supported over a   10
    span of 6m. If the beam is subjected to central point load of 12KN. Find the
    maximum bending stress induced in the beam section.