S.B. Roll No..

STRENGTH OF MATERIALS
4th/Mech/RAC/Prod/T&DM/Aeronautical/Auto/5309/Nov'15

Duration: 3 Hrs.   **M.Marks =75**

SECTION-A

Q.1. Fill in the blank: **1.5x10=15**

    (a) Fatigue of metal is caused by........................

    (b) Simple stree is often called.......................

    (c) The temperature strain in a bar is .... proportional to the change in temperature.

    (d) A beam extending beyond the supports is called.................

    (e) .... stress is produced by an axial load.

    (f) The point of contra flexure is also called........................

    (g) The bending equation is written as..............................

    (h) The angle of twist is................. proportional to the twisting moment.

    (i) The resilience of a flat spring is given by..........................

    (j) If the strut is vertical it is known as.............................

SECTION-B

Q.2 Note: Attempt any FIVE questions: **6x5=30**

 (a) Define following terms:

    (i) Ductility **(ii)** Toughness **(iii)** Hardness **(iv)** Hooke's law **(v)** Poission's Ratio

 (b) A bar of 20 mm in square cross-section is subjected to a tensile load of 10^5 N and the measured extension over a length of 200 mm was found to be 0.16 mm. The contraction in the lateral dimension was 0.005 mm. Determine the modulus of rigidity.

 (c) State and explain " Theorem of parallel axis".

 (d) A cantilever of 3 m span carries a point load of 25 kN at free end in addition to its self weight of 8000 N/m. If the permissible bending stress is 120 N/mm^2, find section modulus required for the beam section.

 (e) Derive expression for the strain energy stored in a body when the load is applied gradually.

 (f) Find the maximum shear stress induced in a solid circular shaft of diameter 200 mm when shaft is to transmit 187.5 kW at 200 rpm.

 (g) A steel specimen 1.5 cm^2 in cross-section stretches0.05 mm over 5 cm gauge length under an axial oad of 30 kN. Calculate the strain energy stored in the specimen at this point. If the load at the elastic limit for the specimen is 50 kN, calculate the elongation at the elastic limit and the resilience.

SECTION-C

Note: Attempt any THREE questions: **3x10=30**

Q.3.   A bar of 30 mm diameter is subjected to pull of 50 kN. The measured extension on guage length of 250 mm is 0.10 mm and change in diameter is 0.005 mm. Calculate:

    (i) Young's modulus.

    (ii) Possion's ratio.

    (iii) Bulk modulus.

Q.4.   A simple supported beam 6 m long is carrying a uniformy distributed load 2 kN/m over a length of 3 m from left end. Draw the S.F. and B.M. diagrams for the beam and also calculate the maximum B.M. on the section.

Q.5 (a) Derive an equation for the energy stored due to shear stress.

   (b) Derive an expressionfor longitudinal stress for a thin shell subjected to an internal pressure.

Q.6.   Derive the torsion equation: **$T/I_P = τ/R = Cθ/L$**

Q.7 (a) Determine the maximum slope and deflection in cantilever beam with uniformly distributed load.

   (b) A steel cantilever projecting 3 m from a wall is loaded with a uniformly distributed load of 20 kN/m run. Find the slope and deflection of the beam if the moment of inertia of the beam section is 7550 cm^4.   Take E = 210 GN/m^2