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Roll No .....

CE/FT-303

B.E. III Semester

Examination, December 2016

Strength of Materials

Time : Three Hours

Maximum Marks : 70

Note: Attempt any five questions. All questions carry equal marks. Assume suitable data or dimensions, if necessary, clearly mentioned it.

1. a) What do you mean by 'Theory of failure'? Give the list of various theory of failure and explain any one of them.
   b) A 2m steel bar of diameter 15mm is subjected to an axial pull of 75 kN. Calculate the change in length, diameter and volume of the bar, if the Poisson's ratio is 0.25. Also find the work done in stretching the bar. Take, is 200 kN/mm^2.

2. a) What is Macaulay's method of beam deflection analysis? What are its advantages over the direct integration method?
   b) A 250mm deep and 150mm wide rectangular beam is subjected to a maximum bending moment of 250kN. Determine the maximum stress produced in the beam and the radius of curvature for the portion of the beam where bending is maximum.

3. a) Find the expression for strain energy of a shaft acted upon by bending and torsional stresses.
   b) The mean diameter of an open coiled helical spring is 96mm and the pitch of the coil is 100mm. The diameter of the wire is 12mm and the number of the coil is 10. Find the axial torque on the spring which will produce a shear stress of 210 MPa. Take E = 204 GPa and G = 82 GPa.

4. a) Describe the method to find the moments of inertia about two mutually perpendicular axes through the centroid when the moments of inertia about the principal axes are known.
   b) Find the ratio of numerical values of maximum and minimum stresses for a curved bar of rectangular section in pure bending if the radius of curvature is 90mm and the depth of beam 60mm also locate the position of neutral axis.

5. a) Determine the critical load for a long slender bar clamped at one end, free at the other, and loaded by an axial compressive force applied at the free end.
   b) Determine the critical load for a W 10×21 section acting as a pinned end column. The bar is 3.6576m long and E = 206.85 GPa. Use Euler's theory.

6. a) What is Mohr's stress circle? How is it useful in the solution of stress analysis problems?
   b) A spherical shell of 1.2m internal diameter and 6mm thickness is filled with water under pressure until the volume is increased by 400×10mm^3. Find the pressure exerted by water on the shell. Take E = 204GPa and V = 0.3.

7. A simply supported beam of 7m span with overhang rest on supports which are 4m apart. The left end overhanging is 2m. The beam carries loads of 30kN and 20kN on the left and the right ends respectively apart from a uniform distributed load of 25kN/m between the supporting points. Draw the shear force and bending moment diagrams.

8. Write short notes on following (any four) :
   a) Elastic constants
   b) Conjugate beam method
   c) Compound cylinders
   d) Pure bending
   e) Slenderness Ratio
   f) Rankine formula

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