External diameter = 200mm

Internal diameter = 170mm

Safe crushing stress = 550 N/mm^2

Modulus of elasticity = 1.2x10^5 N/mm^2

α = 1/1600

Or

10. a) Differentiate between short and long columns?

b) A slender pinned ended aluminum column 2 m long is to hare a thin-walled circular cross-section of outside diameter 5 cm. Calculate the wall thickness required in order to attain a factor of safety of 2 against failure by buckling in actual load of 13.5 kN. Use Euler's formula. Take E = 0.7x10^4 kN/m^2.

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Total No. of Questions :10] *[Total No. of Printed Pages :4*

Roll No .....

CE/FT - 303

B.E. III Semester

Examination, December 2012

Strength of Materials

Time : Three Hours

Maximum Marks : 70/100

Note: *Attempt all questions. Assume missing data, if any.*

1. a) Define shear strain and Poisson's ratio.

b) A mild steel flat 150mm wide, 20mm thick and 6 metres long carries an axial pull of 300 kN. If the value of modulus of elasticity is 2x10^7 N/cm^2 and Poisson's ratio 0.30, calculate the change in length, width, thickness and volume of the flat.

Or

2. a) Define principal planes and principal stresses.

b) At a point, stresses in two mutually perpendicular directions are 8 kN/cm^2 compressive and 2 kN/cm^2 compressive along with a shear stress of 2 kN/cm^2. Determine magnitudes of principal stresses and their directions and maximum shear stress at the point.

3. a) What is section modulus?

b) beam of symmetrical section has a depth of 45cm and moment of inertia 27536 cm^4 about its axis of bending. Find the maximum permissible span for this beam to carry a UDL of 25 kN/m without exceeding bending stress of 12 kN/cm^2.

Or

a) Derive the general expression for deflection of a simply supported beam of span 'L' and carrying a point load 'W' at its center. Assume the flexural rigidity of the beam as EI.

b) Calculate the maximum deflection for a beam of span of 5m if it carries a uniformly distributed load of 4 kN/m over the entire span. Also state the value of the slope at the point of maximum deflection. The size of the beam is 200mm x 300mm and modulus of elasticity is $2x10^6$ kN/mm^2.

a) What do you mean by the torsional rigidity of the shaft. What is its significance?

b) A solid circular shaft is to transmit 375 kW at 150 RPM. Find the diameter of the shaft if the shear stress is not to exceed 65 N/mm^2.

Or

a) Differentiate between open coil and closed coil helical springs.

b) A closed coiled helical spring is to carry an axial load of 100N at shear stress of 9000 N/cm^2 and deflection of 1 cm. The spring is to be made out of round wire having modulus of rigidity of $0.8x10^7$ N/cm^2. The mean diameter of the coils is to be 10 times the diameter of wire. Find the diameter and length of the wire necessary to form the spring.

7. a) Define shear center and state its significance.

b) Determine the shear center of a channel section, which has flanges of 150mm x 20mm and web of 200mm x 10mm dimensions.

Or

8. a) Define unsymmetrical bending.

b) An equal angle section of size 150x150x19mm is used as a beam with the load applied in the plane Y-Y parallel to the vertical leg as shown in Fig. 1. If the permissible stress is 14 kN/cm^2, calculate the bending moment, which the section can carry safely. Take $I_{XX} = I_{YY} = 1170$ cm^4 and $I_{XY} = 690$ cm^4.

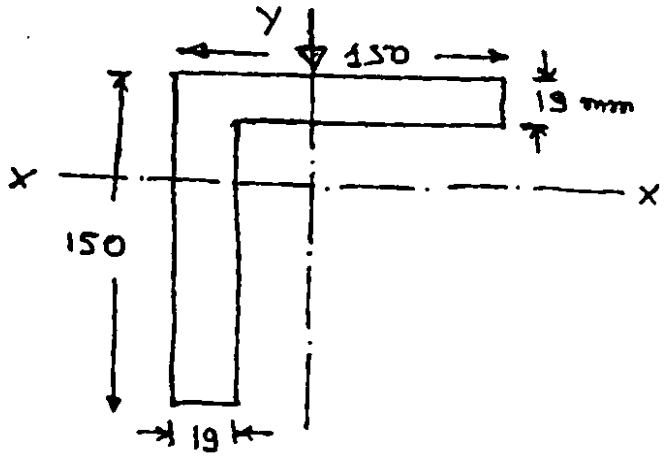

Fig. - 1

9. a) Derive the expression for Euler's bucking load of a column having both ends hinged.

b) Find the Rankine's crushing load for a hollow cylindrical column hinged at both the ends with the following data:

Length of column = 7 metres