OR

Explain the neutral axis of a beam. A steel plate is bent into a circular are of radius 10m. If the plate section be 120mm wide and 20mm thick find the maximum stress induced and the bending moment which can produce this stress take $E = 2 \times 10^5$ N/mm^2.

Unit-V

5. a) What is the difference columns and struts.
   b) Define eccentric loading in the column.
   c) Define:
      i) Slanderous ratio
      ii) Long column
      iii) Short columns
   d) Derive Rankine's formula for long column. A mild steel tube 4m long, 30mm internal diameter and 4mm thick is used as a strut with both end hinged, find the crippling load $E = 2.1 \times 10^5$ N/mm^2.

OR

A strut 2.50m long is 60mm in diameter. One end is fixed, while other hand is find the safe compressive load for the member using Euler's formula allowing a factor of safety of 3.5. Take $E = 2.1 \times 10^5$ N/mm^2.

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Roll No .....

CE/FT - 303

B.E. III Semester

Examination, June 2016

Strength of Materials

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Define Hooke's law for elastic material.
   b) Explain internal strain and Poisson ratio.
   c) Derive the relation between the modules of elasticity and modules of rigidity.
   d) The following data refers to a mild steel specimen tested in a laboratory:

Diameter of the specimen	= 25 mm
Length of the specimen	= 300 mm
Extension under a load of 15 kN	= 0.045 mm
Load at yield point	= 127.65 kN
Maximum load	= 208.60 kN
Length of the specimen after failure	= 375 mm
Neck diameter	= 17.75 mm

Determine; young modulus, yield point, ultimate stress, percentage of elongation, percentage reduction in area, safe stress while adopting a factor of safety of 2.

OR

What is a principal plane? The principal stresses at a point in a bar are 200 N/mm^2 (Tensile) and 100N/mm^2 (Compressive). Determine the resultant stress in magnitude and direction on plane inclined at maximum intensity of shear stress in the material at the point.

Unit - II

2. a) Define the concept of pure bending.

   b) Define neutral axis.

   c) What are the assumptions made in the theory of simple bending?

   d) A simply supported beam of 3 meter span carries point loads of 120 kN and 80kN a distance of 0.6 and 2meter from the left side of the support. If moment of inertia for the beam = 16×10^8 mm^4 and E = 210 GN/m^2, find the deflection under loads.

OR

Determine the slope and deflection of simple supported beam carrying uniformly distributed load using Macaulay's method.

Unit - III

3. a) What are the assumptions made in the theory of pure torsion?

   b) Explain the power transmitted by shaft.

   c) How strength of cylinder can be improved?

   d) A close-coiled helical spring is made by wrapping a 2cm diameter steel wire around Mandrel and is subjected to a load of 500N. Compute the number of coils and the mandrel diameter so that the maximum shear stress and axial elongation are 5kN/cm^2 and 5cm respectively. Neglect the curvature of the wire in stress calculation. Assume G for wire as 8×10^6 N/cm^2.

OR

A hollow cylindrical drum 600mm in diameter has a trichinous of 10mm. If the drum is subjected to an internal air pressure of 3 N/mm determine the increase in the volume of the drum. Take E = 2×10^5 N/mm^2 and 1/m = 0.3.

Unit-IV

4. a) Define product of inertia.

   b) Explain the principle of moment of inertia.

   c) Describe unsymmetrical bending and shear centre.

   d) Determine the moment of inertia of the given section in figure along the line B-B.