(b) A cured bar of rectangular section, initially unstressed is subjected to bending moment of 2000 N-m tends to straighten the bar. The section is 5 cm wide and 6 cm deep in the plane of bending and mean radius of curvature is 10 cm. Find the position of neutral axis and the stress at the inner and outer face.

PART C — (1 × 15 = 15 marks)

16. (a) The rectangular stress components of a point in three dimensional stress system are defined as a $\sigma_x = 20$ MPa, $\sigma_y = -40$ MPa, $\sigma_z = 80$ MPa, $\tau_{xy} = 40$ Mpa, $\tau_{yz} = -60$ MPa, $\tau_{xz} = 20$ MPa. Determine the principal stresses and principal planes.

Or

(b) From the following data of column and circular section, calculate the extreme stresses on the column section. Also find the maximum eccentricity in order that there may be no tension anywhere on the section.

External diameter = 20 cm, internal diameter = 16 cm, length of the column = 4 m, load carried by the column = 175 kN. Eccentricity of the load = 2.5 cm (from the axis of the column). End conditions = both ends fixed. Young's modulus = 94 GN/m².

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80079

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Civil Engineering

CE 8402 — STRENGTH OF MATERIALS — II

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the terms Resilience and Proof Resilience.

2. State Maxwell's reciprocal theorem.

3. Write Clapeyron's three moment equation for continuous beams when flexural rigidity is same and supports are at same level.

4. Find the reaction at prop for a propped cantilever subjected to concentrated load at centre.

5. List out the limitations of Euler's theory of columns.

6. Calculate the bursting pressure for cold drawn seamless steel tubing of 50 mm inside diameter with 2 mm wall thickness. The ultimate strength of steel is 400 MN/m².

7. Define Principal stress.

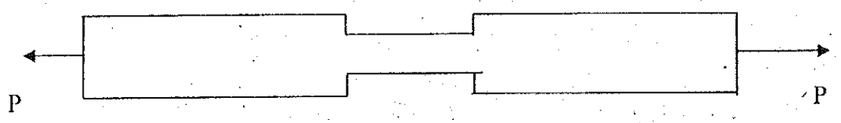
8. List out different theories of failure.

9. Define shear centre.

10. Define Principal moment of inertia.

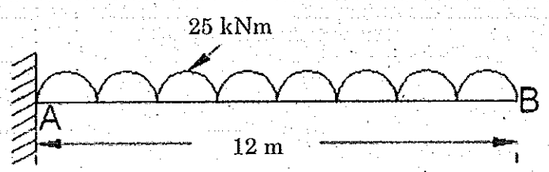
PART B — (5 × 13 = 65 marks)

11. (a) A 1.6 m long bar is applied an axial pull such that the maximum stress induced is 140 MPa. The larger and the smaller areas of cross section are 240 mm² and 120 mm². Determine strain energy stored in the bar. Take E = 200 GPa.

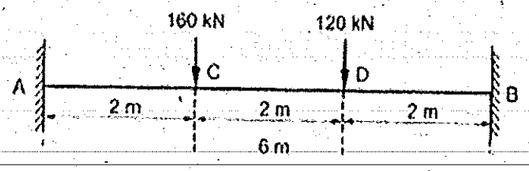


Or

(b) Determine vertical displacement at free end of a cantilever beam shown in fig. using method of virtual work. Take $E = 2\times10^5$ MPa and $I = 825\times10^7$ mm^4.

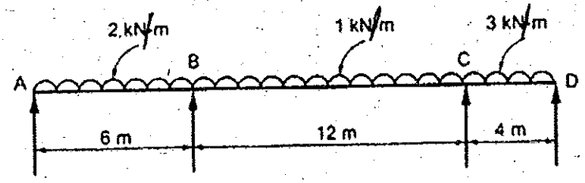


12. (a) A fixed beam AB of length 6 m carries point load of 160 kN and 120 kN at a distance of 2 m and 4 m from the left end A. Find the fixed end moments and the reactions at the supports. Draw Bending Moment and Shear Force diagrams.



Or

(b) A continuous beam consists of three successive spans of 6 m and 12 m and 4 m and carries load of 2 kN/m, 1 kN/m and 3 kN/m respectively on the spans. Draw Bending Moment Diagram and Shear Force Diagram for the beam.

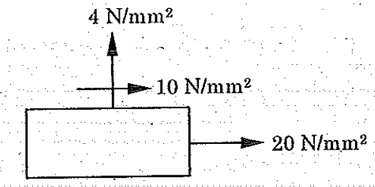


13. (a) Determine the shortest length for a pin jointed column of cross section 75 mm × 48 mm using Euler's formula. Take critical stress value as 220 MPa and E = 205 GPa.

Or

(b) A cast iron pipe has 20 mm internal diameter and 50 mm metal thickness, and carries water under a pressure of 5 N/mm². Calculate the maximum and minimum intensities of circumferential stress and sketch distribution of circumferential stress intensity and the intensity of radial pressure across the section.

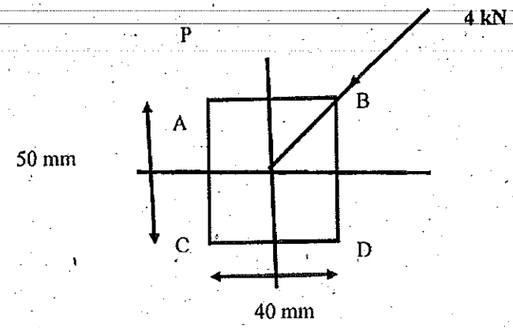
14. (a) For the state stress shown in fig. Find the principal plane and principal stress and maximum shear stress.



Or

(b) A steel shaft is subjected to an end thrust producing a stress of 90 MPa and the maximum shearing stress on the surface arising from the torsion is 60 MPa. The yield point of the material is simple in simple tension was found to be 300 MPa. Calculate the factor of safety of the shaft according to (i) Maximum shear stress theory (ii) Maximum distortion energy theory.

15. (a) Calculate the stresses at the corners of the rectangular section of a simply supported beam of span 5 m which carries a load of 4 kN at the centre of the span. The load line is inclined at an angle of 30° to the vertical longitudinal plane as shown in figure and passes through the centroid of the section. The dimensions of the section are shown.



Or