06-06-2026 SE MECHANICAL SEM-III (NEP-2020) SOM QP CODE: 20008609

Time: 02 Hours **Marks: 60**

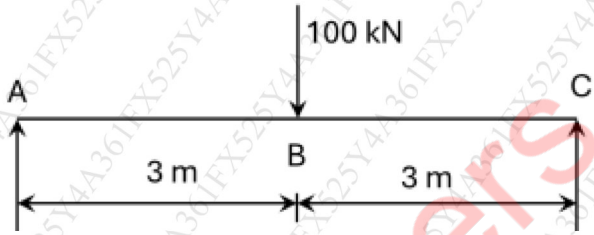
NB: 1. The question paper consists of 6 questions, each of 15 marks.
2. Question number 1 is **compulsory**.
3. Attempt **any THREE** questions from Q2 to Q6.
4. Figures to the right indicate full marks.
5. Assume suitable data wherever necessary and state it clearly.

Q1 Attempt any ***FIVE*** of the following

a) Draw the stress-strain diagram for ductile material and show the salient points on the diagram. 3M

b) State assumptions made in the theory of pure torsion (any three). 3M

c) For the simply supported beam loaded as shown in the figure below, draw the shear force diagram. 3M

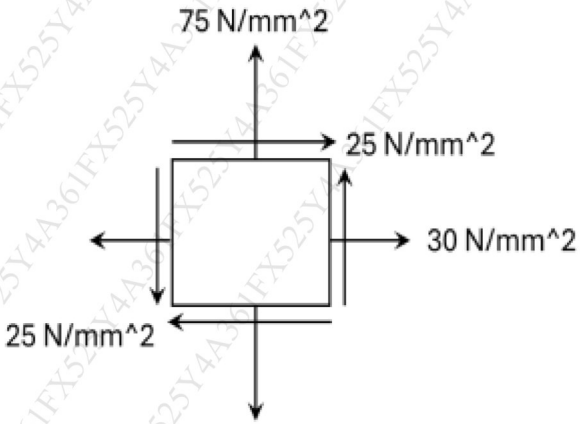


d) The spherical shell has an internal diameter of 1000 mm and a thickness of 20 mm. State whether the given shell is thick or thin. Also, calculate the circumferential stresses in the shell when subjected to an internal pressure of 3 MPa. 3M

e) State three boundary conditions in the case of a simply supported beam of length L and acted upon by a point load at the midpoint. 3M

f) State any three limitations of Euler's theory of columns. 3M

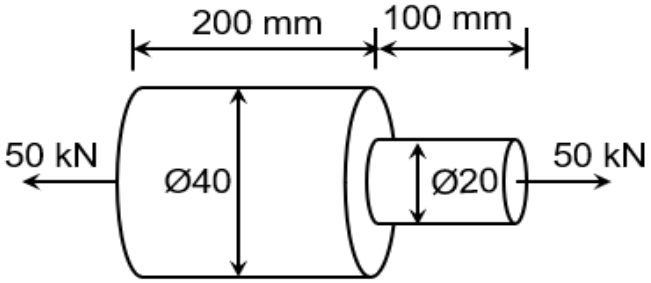
Q2 a) At a point in a material, the intensity of stress on two mutually perpendicular planes is 75 N/mm^2 and 30 N/mm^2, both tensile. These stresses also accompany shear stresses of 25 N/mm^2 intensity as shown in the figure. Determine the intensity of principal stresses and maximum shear stress using Mohr's circle method. 05M



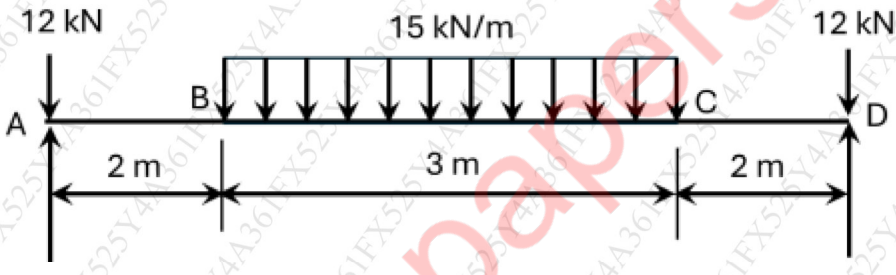
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Q3 a) Calculate the strain energy of the bar shown in the figure below. Take E = 200 GPa. 05M



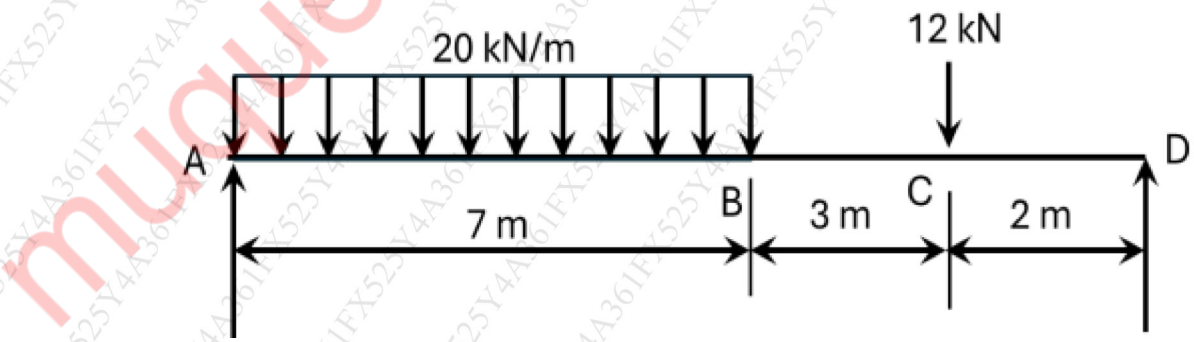
b) A beam of 7 m in length is loaded as shown in the figure below. Using Macaulay's method, determine the slope at point B and deflection at point C. Take EI = Constant. 10M



05M

Q4 a) A closed cylindrical vessel of 4 mm thickness carries a fluid under 3 N/mm^2 pressure. The diameter of the vessel is 250 mm, and the length is 750 mm. Calculate the longitudinal, hoop, and maximum shear stresses in the cylinder wall.

b) A simply supported beam AD of 12 m length is loaded as shown in the figure below. Draw the shear force and bending moment diagrams for the beam. 10M

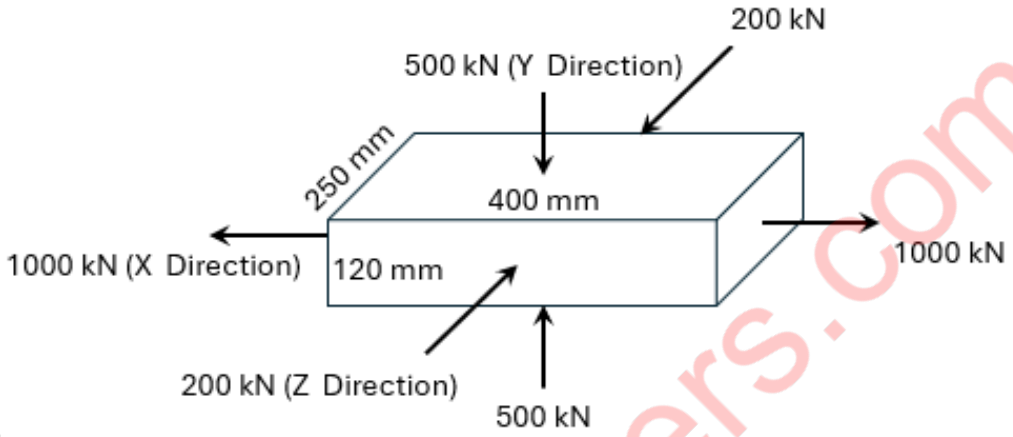


05M

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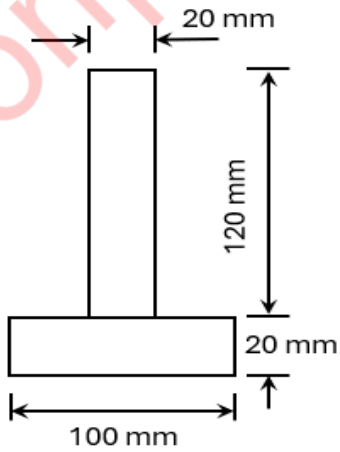
Q5 a) A solid round bar of 3 m length and 50 mm diameter is used as a column with both ends hinged. Determine the crippling load if the modulus of elasticity is 200 GPa.

b) A rectangular block is loaded as shown in the figure below. Find the change in dimension of the block in X, Y, and Z directions. Take E = 210 GPa and Poisson's ratio = 0.3 10M



Q6 a) Write a short note on Rankine theory 05M

b) The beam of the inverted T section is acted upon by the sagging bending moment of 30 kN-m. Calculate the maximum bending stresses in tension and compression at the extreme fibers of the section. Also, draw the bending stress distribution diagram across the section. 10M



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