

90010

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PART - B

(5×13=65 Marks)

11. a) Determine the forces in the members of the truss shown in Fig. 1. Consider the method of joints.

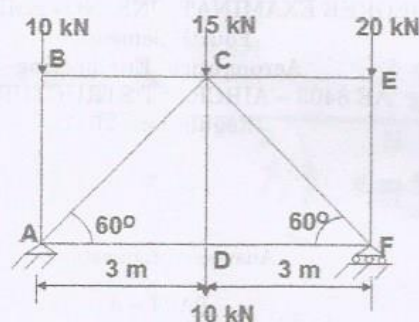


Fig. 1

(OR)

- b) A beam of length 15 m consisting three spans is subjected to loads as shown in Fig. 2. Determine the support reactions using three moment equation.

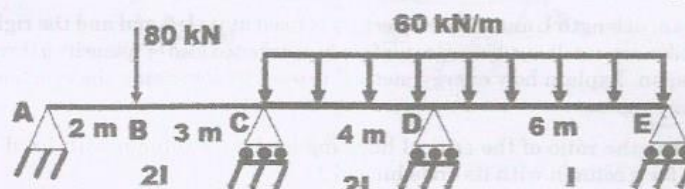
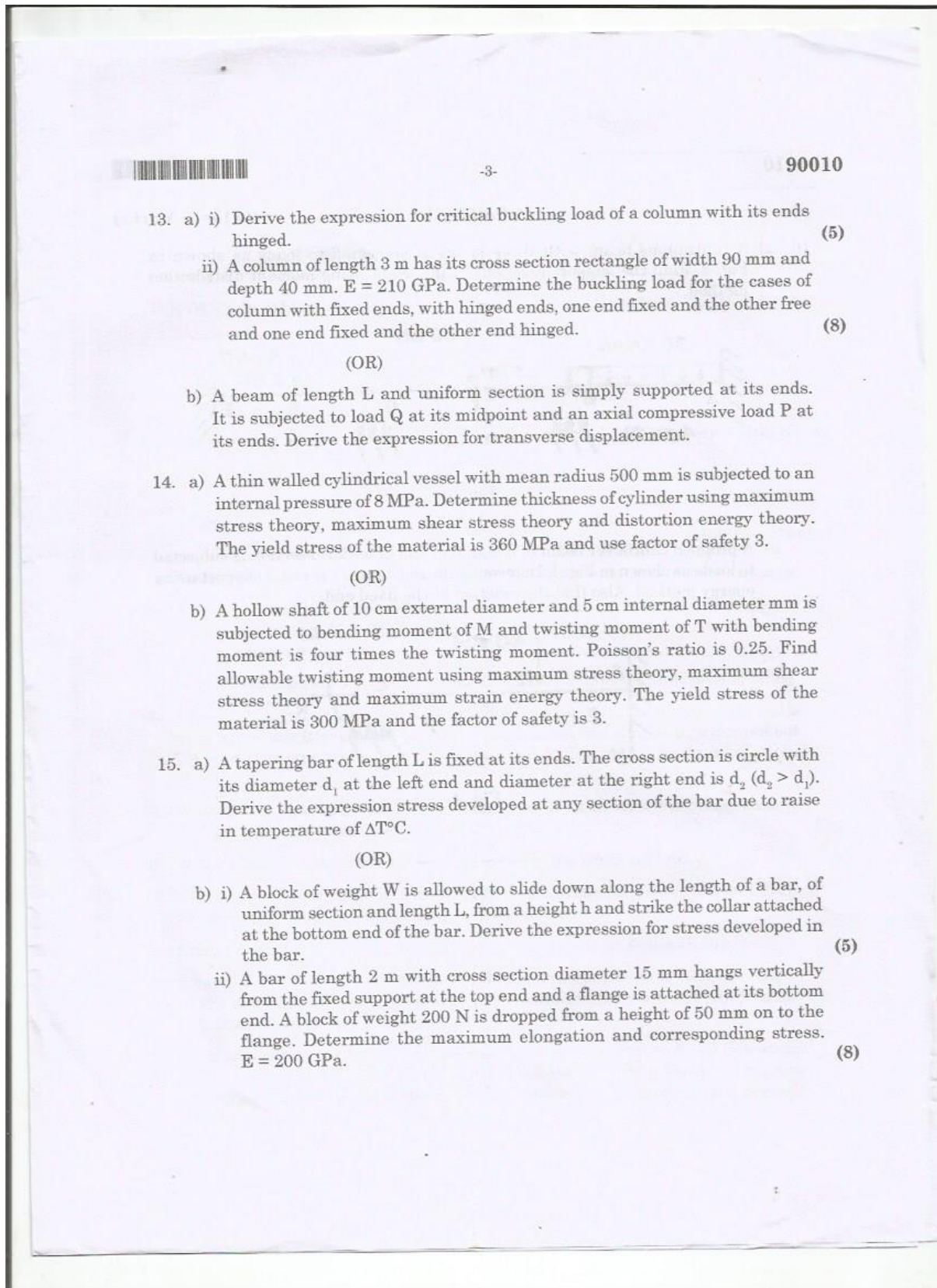


Fig. 2

12. a) A beam ABC of length L and uniform section is simply supported at A and C. It is subjected to load P , acting downward, at B at a distance 'a' from A. Determine deflection at B using energy method. Simplify the deflection expression for $a = L/2$.

(OR)

- b) A cantilever beam of length L and of uniform section is subjected to uniformly distributed load of intensity q throughout the entire length of the beam. Determine the slope and deflection at the tip using energy method (dummy load method).



13. a) i) Derive the expression for critical buckling load of a column with its ends hinged. (5)
- ii) A column of length 3 m has its cross section rectangle of width 90 mm and depth 40 mm. $E = 210 \text{ GPa}$. Determine the buckling load for the cases of column with fixed ends, with hinged ends, one end fixed and the other free and one end fixed and the other end hinged. (8)

(OR)

- b) A beam of length L and uniform section is simply supported at its ends. It is subjected to load Q at its midpoint and an axial compressive load P at its ends. Derive the expression for transverse displacement.
14. a) A thin walled cylindrical vessel with mean radius 500 mm is subjected to an internal pressure of 8 MPa. Determine thickness of cylinder using maximum stress theory, maximum shear stress theory and distortion energy theory. The yield stress of the material is 360 MPa and use factor of safety 3.

(OR)

- b) A hollow shaft of 10 cm external diameter and 5 cm internal diameter mm is subjected to bending moment of M and twisting moment of T with bending moment is four times the twisting moment. Poisson's ratio is 0.25. Find allowable twisting moment using maximum stress theory, maximum shear stress theory and maximum strain energy theory. The yield stress of the material is 300 MPa and the factor of safety is 3.
15. a) A tapering bar of length L is fixed at its ends. The cross section is circle with its diameter d_1 at the left end and diameter at the right end is d_2 ($d_2 > d_1$). Derive the expression stress developed at any section of the bar due to raise in temperature of $\Delta T^\circ\text{C}$.

(OR)

- b) i) A block of weight W is allowed to slide down along the length of a bar, of uniform section and length L , from a height h and strike the collar attached at the bottom end of the bar. Derive the expression for stress developed in the bar. (5)
- ii) A bar of length 2 m with cross section diameter 15 mm hangs vertically from the fixed support at the top end and a flange is attached at its bottom end. A block of weight 200 N is dropped from a height of 50 mm on to the flange. Determine the maximum elongation and corresponding stress. $E = 200 \text{ GPa}$. (8)

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PART - C

(1×15=15 Marks)

16. a) A continuous beam with three spans is subjected to loads as shown in Fig. 3. Find the support reactions of the beam using moment distribution method.

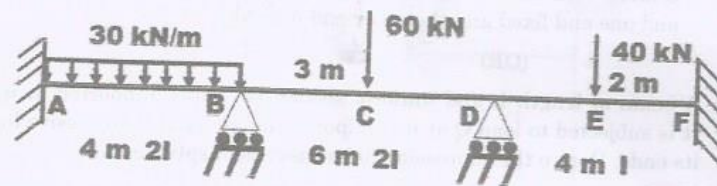


Fig. 3

(OR)

- b) A propped cantilever beam of length 6 m and of uniform section is subjected to loads as shown in Fig. 4. Determine the reaction at the roller support using energy method. Also find the reaction at the fixed end.

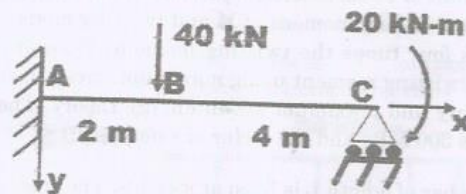


Fig. 4