M.E. DEGREE EXAMINATIONS: NOVEMBER 2009

Third Semester

STRUCTURAL ENGINEERING

P07SEE13 Stability of Structures

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 2 = 20 Marks)

1. Discuss the types of equilibrium with neat sketches.

2. What are the methods for solving stability problems?

3. Define inelastic behaviour of columns.

4. Define column curves.

5. Sketch any two portal frames with and without sway.

6. State the uses of Wood's Charts.

7. Define Flexural torsional buckling.

8. Express equilibrium and energy approach method.

9. Define stiffener.

10. Define thick plate theory.

PART B (5 x 16 = 80 Marks)

11. a).Derive an expression for the mid – height deflection of an imperfect column with hinged ends. Discuss its behaviour with an ideal column. (16)

(OR)

b).Find the critical buckling load of an initially bent column using imperfect method where $y = a \sin\left(\dfrac{\pi x}{l}\right)$. (16)

12. a). Determine the buckling load of a column laterally supported at three points such that the length is 'a' times the inner length L and when the entire length is uniformly compressed. Plot the variation of P verses a. Use the governing differential equation to solve the problem. (16)

(OR)

b). A cantilever of length L and flexural stiffness EI is loaded by two concentrated loads P one of which acts at the top and the other at mid-height. Calculate the elastic buckling load by Ritz method or Galerkin's method. (16)

13. a). Obtain the critical load of a column with one end fixed and other free if it is subjected to an axial load P. The moment of inertia of the member varies linearly from '3I' at the fixed end to 'I' at the free end. (16)

(OR)

b). Find the critical load at which the frame will buckle laterally for the fig.1

I column = 0.35 x 10- 4m^4, I beam = 0.275x10-4m^4, E = 181.5 GPa. (16)

P

1/2   h

h

Fig.no: 1
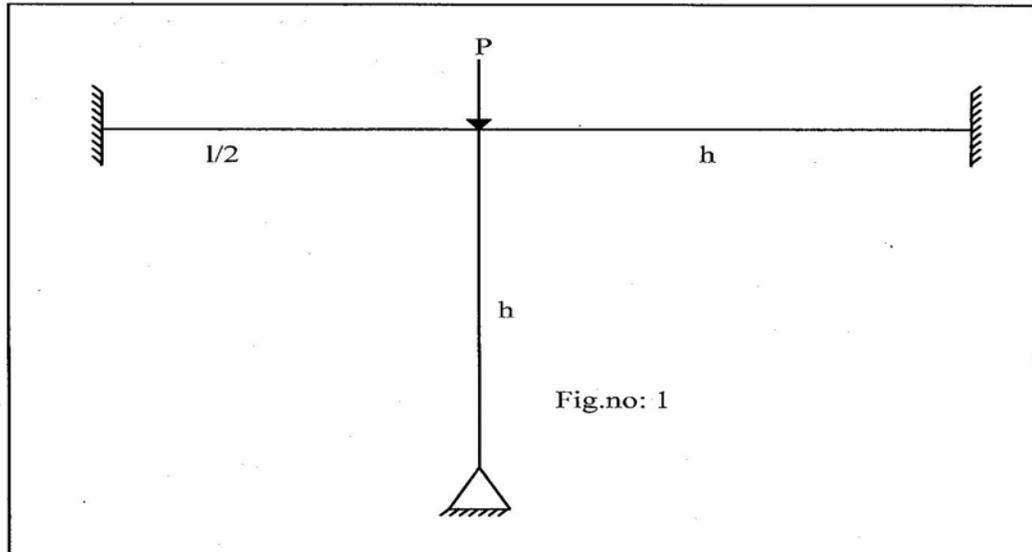
14. a). Explain briefly the following:

i) Flexural buckling and torsional buckling. (11)

ii) Lateral buckling of beams. (5)

(OR)

b). A cantilever beam of uniform cross-section and length 'l' is subjected to a lateral load at the end through the centroid of the section. Find the buckling load. (16)

15. a). A square plate clamped on all its edges is axially compressed along all the edges with a force of 'N' per unit length. Find the critical value of 'N'. (16)

(OR)

b). Find the critical load of a rectangular simply supported plate of size (3a x a). The plate is loaded along its shorted edge by an udl of 5 kN/m. Modulus of elasticity is 0.7x10^5 N/mm^2 and poisons ratio is 0.3 (16)

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