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

Question Paper Code: 92064

M.E. DEGREE EXAMINATION, MAY 2016

Elective

Structural Engineering

01PSE512 – STABILITY OF STRUCTURES

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. List the various approaches for analyzing stability of column.
2. Write the governing differential equation for the buckling of column.
3. Quote the uses of Shanley's model.
4. Explain tangent modulus theory.
5. Define beam-column.
6. How the buckling load of a column with variable cross section is obtained?
7. Write a note on St.Venant's torsion.
8. Discriminate between local buckling and lateral buckling
9. Draw elastic buckling of thin plates.
10. Write down the expression for evaluating the critical stress in uni-axially loaded plate.

PART - B (5 x 14 = 70 Marks)

11. (a) Obtain the critical load by imperfection approach for both ends fixed column. (14)

Or

(b) Derive the critical load by equilibrium method for (i) Hinged-Hinged column (ii) Fixed-Fixed column. (14)

12. (a) Briefly discuss about the double modulus theory. Also derive the differential equation for the column buckling in the inelastic range. (14)

Or

(b) Determine the critical buckling load for column with fixed - hinged boundary condition using Galerkin's method. (14)

13. (a) Derive an expression for simply supported plate subjected to compressive force along boundary by finite difference method. (14)

Or

(b) Determine the critical buckling load of portal frame with sway shown in Fig.2 using stiffness method of analysis. (14)

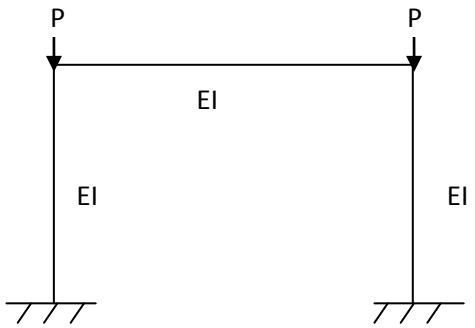

Fig 2

14. (a) Determine the buckling strength of doubly symmetric I-section of 4 *m* long column

(i) about its major axis (x - x)

(ii) about its minor axis (y - y)

(iii) for torsional buckling

The end conditions were fixed-fixed. Take E = 2.03 x 105 N/mm^2; $G = 0.385E$
The sectional properties of doubly symmetric I-section,

$A=15948mm^2$ $I_x = 1.17585\times10^9\, mm^4$ $I_y = 3.983\times10^7\, mm^4$ $J = 1.2487\times10^6\, mm^4$

$r_x = 271.53mm$ $r_y = 50.04mm$ $C_w = 4.3613\times10^2\, mm^6$

(14)

Or

(b) Derive the expression for the critical lateral buckling moment for the beam subjected pure moment. (14)

15. (a) Derive the governing differential equations of equilibrium for buckling of thin plate subjected to in-plane forces. (14)

Or

(b) Determine the critical buckling load of uniaxially compressed square plate, fixed along all edges by energy method. With suitable assumptions. (14)

PART - C (1 x 10 = 10 Marks)

16. (a) Determine the critical buckling load for both end fixed column by differential equation approach. (10)

Or

(b) Using the Rayleigh Ritz's method, determine the critical load for column fixed at one end and free at the other end. (10)

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