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

Question Paper Code: 32961

M.E. DEGREE EXAMINATION, NOVEMBER 2015.

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. Explain the concept of stability of structure with reference to the equilibrium conditions.
2. List the various approaches for analyzing stability of column.
3. State theorem of minimum potential energy.
4. Quote the uses of Shanley's model.
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. Write down the expression for evaluating the critical stress in uni-axially loaded plate.
10. Draw elastic buckling of thin plates.

PART - B (5 x 14 = 70 Marks)

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

Or

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

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

Or

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

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

Or

(b) Arrive at an expression for non - sway buckling frame to find the critical load. (14)

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,

$A = 15948 mm^2$ $I_x = 1.17585 \times 10^9 mm^4$ $I_y = 3.983 \times 10^7 mm^4$ $J = 1.2487 \times 10^6 mm^4$

$r_x = 271.53 mm$ $r_y = 50.04 mm$ $C_w = 4.3613 \times 10^2 mm^6$ (14)

Or

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

15. (a) A simply supported long plate with Young's modules E, Poisson's ratio μ, is of length a, width b and thickness t. Determine the critical buckling stress of the plate assuming it carries a uniform axial compression on short edges and uniform tension on long edges. Use energy or finite difference method. (14)

Or

(b) Determine the critical buckling loading for a simply supported square plate loaded in two perpendicular directions by uniformly distributed load. Obtain an exact solution by solving the governing differential equation. (14)

PART - C (1 x 10 = 10 Marks)

16. (a) Explain in detail about Newman's method and finite difference method with examples. (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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