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

Question Paper Code: 52614

M.E. DEGREE EXAMINATION, NOV 2016

First Semester

Structural Engineering

15PSE104 - STABILITY OF STRUCTURES

(Wood chart and Stability functions table may be permitted)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

(5 x 20 = 100 Marks)

1. (a) (i) Determine the buckling load of a fixed-hinged column using equilibrium approach. (10)

(ii) Explain stable and unstable equilibrium. (10)

Or

(b) Draw the characteristic curve for deflection of eccentrically loaded column hinged at both the ends and prove that the critical load is always less than the Euler critical load of an axially loaded column. (20)

2. (a) Determine the critical load of a cantilever column of length L using Rayleigh Ritz method. The flexural rigidity is I for the upper half and is $2I$ for the bottom half. The column carries an axial load of Pat free end and $2P$ at the mid height. (20)

Or

(b) Derive the higher order governing equation for stability of columns. Hence analyze the column with one end clamped and other hinged boundary condition. (20)

3. (a) (i) Derive the stability analysis of Beam-Column with central concentrated load. (10)

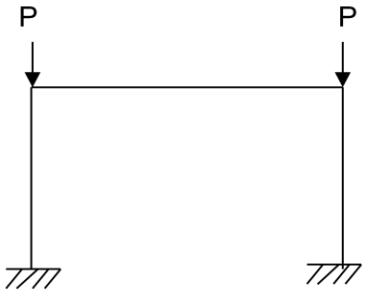
(ii) What is the amplification factor for deflection in Beam-Column. (10)

Or

(b) (i) Derive the stability analysis of Beam-Column with central concentrated load. (15)

(ii) What is the amplification factor for deflection in Beam-Column? (5)

4. (a) (i) Determine the critical load of portal frame with sway shown in figure using equilibrium approach. (15)



(ii) Sketch the buckling modes of frames with and without sway. (5)

Or

(b) (i) Explain the role of finite element method in structural stability analysis. What is stress stiffness matrix? (15)

(ii) Define: Stability functions and Rotation functions. (5)

5. (a) For a thin rectangular flat plate that is subjected to a uniform compressive force *Px* in the longitudinal direction, the governing differential equation may be taken as $DD\nabla^4 w + \frac{P_x}{b} w_{xx} = 0$. If all the four edges are simply supported, a solution of the form is seen to be the exact solution. Prove it $w = C_1 \sin (m\pi x/a) \sin (n\pi y/b)$. (20)

Or

(b) (i) Explain the governing of differential equation and buckling of thin plates. (10)

(ii) Explain the various edge condition of equilibrium equation. (10)