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**C Reg. No. :**

**Question Paper Code: 51P64**

M.E. DEGREE EXAMINATION, NOV 2017

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

PART - A (5 x 1= 5 Marks)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. | Effective Length of a fixed – fixed column is | | | | | | CO1- R | | | |
|  | (a) 0.707 L | | | | (b) L/2 | | | | | |
|  | (c) 2L | | | | (d) L | | | | |
| 2. | In \_\_\_\_\_ method equilibrium will be established by Principle of Stationary Potential Energy. | | | | | | CO2 -R | | | |
|  | (a) Energy | | (b) | | | (c) | (d) Finite difference | | | |
| 3. | A member subjected to axial load and bending is called as | | | | | | CO3- R | | | |
|  | (a) Beam | | (b) Column | | | (c) Slab | (d) Beam-Column | | | |
| 4. | Critical load of frames prevented from side sway will be in  the range of | | | | | | CO4 -R | | | |
|  | (a) PE to 2PE | | (b) ¼ PE to PE | | | (c) 2PE to 4PE | (d) 1.5PE to 4PE | | | |
| 5. | In Buckling Analysis of Thin Plates \_\_\_\_\_\_\_\_\_ is negligible. | | | | | | CO5- R | | | |
|  | (a) Normal Stress | | | (b) Normal Strain | | (c) Shear Strain | (d) All the above | | | |
|  | PART – B (5 x 3= 15Marks) | | | | | | | | | |
| 6. | Explain how equilibrium is established in Energy method. CO1-U | | | | | | | | | |
| 7. | State Principle of Stationary Potential Energy. CO2-U | | | | | | | | | |
| 8. | Define: Beam-Column. CO3-U | | | | | | | | | |
| 9. | Define: Stability functions and Rotation functions. CO4-U | | | | | | | | | |
| 10. | Write the general governing differential equation for buckling of rectangular plates. CO5-U | | | | | | | | | |
|  | PART – C (5 x 16= 80Marks) | | | | | | | | | |
| 11. | (a) | Determine the buckling load of a fixed- fixed column by Equilibrium approach. | | | | | | CO1- Ana | (16) | |
|  |  | Or | | | | | |  |  | |
|  | (b) | Determine the buckling load of a fixed- hinged column by Equilibrium approach. | | | | | | CO1- Ana | (16) | |
|  |  |  | | | | | |  |  | |
| 12. | (a) | Determine an approximate value for the critical load of a hinged-hinged column whose moment of inertia varies linearly from IO to 4 IO from top to bottom. Assume that the deflection is given by | | | | | | CO2- Ana | (16) | |
|  |  | Or | | | | | |  |  | |
|  | (b) | Using Rayleigh-Ritz method determine the buckling load of a hinged- hinged column whose moment of Inertia for top and bottom quarter portion is Io and middle half portion is 4Io. | | | | | | CO2- Ana | (16) | |
|  |  |  | | | | | |  |  | |
| 13. | (a) | Determine the maximum deflection & moment of a beam-column subjected to UDL over the full span using Rayleigh ritz method. | | | | | | CO3-App | (16) | |
|  |  | Or | | | | | |  |  | |
|  | (b) | Derive the slope deflection equation for a beam – column. | | | | | | CO3-App | (16) | |
|  |  |  | | | | | |  |  | |
| 14. | (a) | Using Equilibrium approach determine the critical load of a portal frame subjected to symmetrical loading and prevent from sides way. Take EI and L for beam and column are same. | | | | | | CO4 - Ana | (16) | |
|  |  | Or | | | | | |  |  | |
|  | (b) | Determine the Critical load of the frame shown in figure using stiffness method. EI and *l* are same for all the members. For  αn = -7 ϕ = 3.13 ; For αn = -2 ϕ = 2.55 ; For αn = -6 ϕ = 3.1  P | | | | | | CO4 - Ana | (16) | |
| 15. | (a) | Derive the general governing differential equation for buckling of thin plates subjected to biaxial tensile force along with shear. | | | | | | CO4 - Ana | (16) | |
|  |  | Or | | | | | |  |  | |
|  | (b) | Write the finite difference equation for a square plate fixed along all the edges subjected to biaxial compression ‘N’ and hence find its critical load for first and second approximation. | | | | | | CO5-Ana | (16) | |
|  |  | | | | | | | | | |