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**Question Paper Code: 51U04**

M.E. DEGREE EXAMINATION, NOV 2018

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)

- Effective Length of a fixed – hinged column is CO1- R  
(a)  $0.707 L$                       (b)  $L/2$                               (c)  $2L$                               (d)  $L$
- In Richardson extrapolation scheme the error (e) of approximate solution is proportional to CO2 -R  
(a)  $h$                               (b)  $h^2$                               (c)  $h/2$                               (d)  $h^3$
- In a beam-column for constant transverse load the load deflection curve is \_\_\_\_\_ CO3- R  
(a) Parabolic                      (b) Linear                              (c) cubic parabola                      (d) horizontal
- Critical load of a portal frame for very high values of girder stiffness and it can sway is CO4 -R  
(a)  $P_E$                               (b)  $\frac{1}{4} P_E$                               (c)  $2P_E$                               (d)  $4P_E$
- 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)

- Explain the concepts of equilibrium (Stability). CO1-U
- Determine  $\Delta^3 f_i$ . CO2-App
- Write the slope deflection equation for a beam – column. CO3-U
- Sketch neatly the different buckling modes of a portal frame for very low and very large values of girder stiffness with side sway permitted and also prevented. CO4-U

10. Explain the mechanism by which a plate can carry load even after buckling. CO5-U
- PART – C (5 x 16= 80Marks)
11. (a) Determine the buckling load of a hinged - hinged column by Equilibrium approach. CO1- App (16)
- Or
- (b) Determine the buckling load of a fixed- hinged column by Equilibrium approach. CO1- App (16)
12. (a) Using Rayleigh-Ritz method determine the buckling load of a hinged- hinged column whose moment of Inertia for top and bottom quarter portion is  $I_0$  and middle half portion is  $4I_0$ . CO2- App (16)
- Or
- (b) Determine the critical load of a fixed hinged column by galerkin's method. Take  $y = A(l^3x - 3lx^3 + 2x^4)$  CO2- App (16)
13. (a) Derive the slope deflection equation for a beam – column. CO3-App (16)
- Or
- (b) Determine the maximum deflection & moment of a beam-column subjected to UDL over the full span using Rayleigh ritz method. CO3-App (16)
14. (a) Using Equilibrium approach determine the critical load of a portal frame subjected to symmetrical loading and sides way is permitted. Take EI and L for beam and column are same. CO4 -App (16)
- Or
- (b) Compute the critical load of the frame shown in figure. EI & l are same for both the members. For  $\alpha_n = 1.678$  &  $\alpha_f = 2.779$   
 $\phi = 1.407$  ; For  $\alpha_n = 1.224$  &  $\alpha_f = 2.98$   $\phi = 1.6$  CO4 -App (16)
15. (a) Derive the general governing differential equation for buckling of thin plates subjected to biaxial tensile force along with shear. CO4 - App (16)
- Or
- (b) Find the critical load of a uniaxially compressed square plate, fixed along all the edges using energy method. CO5-App (16)