M.E. (Civil) 1st Semester Examination, 2011

SUBJECTT: STABILITY OF STRUCTURES (CE-903)

Full marks –100 Time: 3 Hours

The questions are of equal value.
Answer any **five** questions.

1. Obtain the critical load P_{cr} for a column of length L and uniform flexural rigidity EI. The column has bottom end fixed and top end hinged.
2. A both ends hinged column with varying moment of inertia has stiffness given by EI for the portion 0.3L on the both end and 3EI for the central portion 0.4L. Calculate the critical load using Newmark's method and estimate the percentage of maximum error.
3. Calculate the buckling load of a flagpole having uniform rigidity EI, length L and self weight q per unit length.
4. (a)Using energy method obtain the expression for Rayleigh's Quotient and also its modified form for the assessment of critical load for buckling of a column.

   (b)Obtain the critical load for a pin-end strut on elastic foundation of modulus of foundation, β. The strut has uniform moment of inertia I and length L.
5. (a) Derive the differential equation for a both end hinged column considering the effect of shearing force on the critical load.

   (b)Calculate the critical load of a built-up column having both end hinged. The column has cross diagonal lacing bars.
6. Derive the differential equation of equilibrium of a plate subjected to combined bending and tension.
7. A rectangular plate simply supported along two opposite side perpendicular to the direction of uniformly compressed load. Obtain the critical load.

8. Using finite difference techniques obtain the buckling load for a column having one bottom end fixed and top end hinged. The column has uniform moment of rigidity EI and span L. Also obtain the mode shape.
9. A prismatic simply supported beam AB of flexural rigidity EI and span L is hinged at A. The beam is subjected to moment at A and axial force at B. Derive the expression for slopes at A & B.
10. A single bay portal with beam of span length 5m, height of column10m has both ends hinged. The beam is subjected to an uniformly distributed load 50 t/m in addition to a concentrated load of 45^t acting as axial force in each column. Assume constant rigidity EI 10,000 t-m^2. Draw the bending moment diagram considering the effect of axial force. Given $\psi(u)$ for u= 1.3 , 1.35, 1.4 are 1.1345, 1.1473, 1.1610 respectively.