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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, M. Tech - Civil Engineering (MCAD)

Semester End Examination; May/June - 2018

Structural Stability Analysis Classical and FE Approach

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1. Derive the expression for the deflection of a simply supported beam-column subjected to an axial thrust '*P*' and a lateral concentrated load '*Q*'. Using this expression, determine the expression for the deflection of a beam-column subjected to a several concentrated loads. 20

2. Using the fourth order differential equation, determine the first two critical loads for a fixed pinned column and fixed free column subjected to an axial thrust *P*. 20

UNIT - II

3. Determine the critical load for a pinned-pinned column subjected to an axial load by assuming a parabolic profile, using the method of successive approximation. 20

4 a. Determine the buckling load for a fixed-fixed column by using energy method. Assume trial function $y = A\left(1-\cos\frac{2\pi x}{L}\right)$. 8

b. Determine the critical load for a cantilever column subjected to a tip load, using the energy method by assuming a displacement configuration approximately equal to a static deflection curve. 12

UNIT - III

5. Derive the shape function for a two nodded Euler Bernoulli beam element and plot their variation. Using this shape function derive the geometric stiffness coefficient kg_{ij}, for $i = 4$, $j = 1$, 2 and 4. 20

6. Determine the buckling load for the pinned-pinned column. The column is discratized into two elements. Take EI = 30 Nm^2 and length of each element is 3 m. 20

UNIT - IV

7. Determine the critical moment for the simply supported I-beam subjected to pure bending against lateral buckling. 20

8. Derive the expression for warping displacement for pure torsion of thin walled open section. Also sketch the variation of warping along the middle line of cross section. 20

UNIT - V

9. Derive the expression for the critical load for a simply supported plate subjected to a uniaxial load 'N_x'. Assume the all four edges are simply supported. Also plot the graph for the plate ratio versus non dimensional parameter *K*. 20

10. Determine the buckling load expression of a simply supported rectangular plate under combined bending and compression. 20

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