SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code: Theory of Structural Stability (**19CE1010**) **Course & Branch**: M.Tech – SE

Year & Sem:I M.Tech & I-Sem **Regulation:** R19

UNIT-I

1. Derive the differential equation for maximum deflection and maximum bending moment in case of beam column with couple forces at ends?
2. a) Derive the differential equation of slope in case of continuous beams with axial loads?
   b) Derive the differential equation for beam columns with compressive force and distributed lateral load?
3. Derive the differential equation for maximum deflection and maximum bending moment in Case of beam column with central load?
4. Derive the differential equation for beam columns with compressive force and distributed lateral load?
5. Derive the differential equation for maximum deflection and end slopes in case of beam column subjected to end couples?
6. Derive the differential equation for maximum deflection and maximum bending moment in case of beam column with built in ends?
7. a) Explain the differential equation of slope in case of continuous beams with axial loads?
   b) Explain the critical load conditions for a bar on elastic foundation.
8. a) Derive differential equation for beam column?
   b) What are the approximate methods used in the stability analysis and discuss their merits.
9. Derive the differential equation for maximum deflection and end slopes in case of beam column subjected to clamped/ built in ends?
10. Find the maximum bending moment in a beam –column on simply support & when subjected to axial load P and concentrated lateral load Q.

UNIT-II

1. Using energy method, determine the critical load of a column with one end fixed and other end free when cross section changes at midpoint.
2. Derive the effect of shear force on value of crippling load.
3. Explain buckling of bars with varying in cross section with a suitable example?
4. Derive Euler's column formula for elastic buckling of straight bars?
5. Derive expression for critical load in case of buckling of bars with intermediate compressive forces?
6. Derive the critical load in case of buckling of bars with effect of eccentric load?
7. Derive the crippling load in case of buckling of bars with distributed axial loading.
8. a) With reference to equilibrium conditions explain the concept of stability of a structure.

   b) Explain Euler's theory of columns stability, write assumptions and limitations.
9. Obtain the Euler's buckling equation of columns for
   a) One end is fixed and the other end is free
   b) Columns with both ends fixed.
10. Derive the crippling load for buckling of:
    a) Bars with intermediate compressive forces
    b) Bars with distributed axial load.

UNIT-III

1. a) Explain the Tangent Modulus and Reduced Modulus theories.

   b) Show that the reduced modulus of rectangular crosses section.

2. Explain Reyliegh – Ritz method. Illustrate with a problem, its application with respect to the determination of critical load of a compressive member.

3. a) Briefly discuss buckling of straight bar column.

   b) Differentiate between elastic buckling & inelastic buckling.

4. Explain reduced modulus theory and its assumptions and also derive critical load of double modulus theory.

5. Derive the reduced modulus of rectangular section.

6. (a) Explain the tangent theory and its assumptions and also show that critical load of tangent modulus

   (b) Explain the Tangent Modulus and Double Modulus theories.

7. Explain Galerkin method. Illustrate with a problem, its application with respect to the determination of critical load of a compressive member.

8. Derive the critical load mathematical of stability problem using Timoshenko method.

9. Explain the various methods for calculating crippling load for buckling of bars in mathematical treatment of stability problems.

10. (a) Compare the Rayleigh-Rutz and Galerkin's method for obtaining the critical load for columns.
    (b) Discuss the effect of shear force on critical load of columns.

UNIT-IV

1. Explain non uniform torsion of thin walled bars of open cross section with neat sketches.
2. Derive the expression for pure torsion of thin walled bars of open cross section.
3. Derive lateral buckling of simply supported beam of narrow rectangular section.
4. Briefly describe torsional buckling, lateral buckling and inelastic buckling.
5. Derive the question for the warping displacement for any bar of thin walled open section subjected to pure torsion.
6. (a) Explain non-uniform torsion of thin walled bars of open cross section with neat sketches.

   (b) Derive the expression for pure torsion of thin walled bars of open cross section.
7. (a) Explain torsional buckling.

   (b) Explain thin walled bars of open cross section by pure torsion.
8. Derive the crippling load for a simply supported beam of narrow rectangular cross section subjected to lateral buckling.
9. (a) Briefly describe torsional buckling, lateral buckling and inelastic buckling.

   (b) Discuss the stability of plates under in plane and transverse loading.
10. Write a short note on torsional buckling and also explain pure torsion of thin walled bars of open cross section.

UNIT-V

1. Derive the crippling load for simply supported beam of rectangular cross section subjected to pure bending
2. Derive the critical value of the compressive force for buckling of simply supported rectangular plates uniformly compressed in one direction.

3. Derive the critical value of the compressive force for buckling of simply supported rectangular plates uniformly compressed in two direction.

4. Derive the expression for critical moment for a simply supported rectangular beam subjected to pure bending

5. Derive the expression for extreme fibre stress at buckling for a simply supported rectangular beam subjected to pure bending

6. Derive the critical value of the compressive force for buckling of simply supported rectangular plates uniformly compressed using any direction method.

7. Derive the expression for the maximum bending moment of a simply supported beam of length L carrying an axial compressive force P and uniformly distributed load q/unit length.

8. Write short notes on
    a) Determine of allowable stress.
    b) Built up columns.
9. Write short notes on
    a) Creep buckling
    b) Orthogonality relation
    c) Pure bending
10. Write short notes on
    a. Difference between lateral & longitudinal buckling.
    b. Write expression for one direction of buckling of simply supported plate.
    c. Write expression for two direction of buckling of simply supported plate.