Course Code: 20CE1010 **R20**

SIDDHARTH GROUP OF INSTITUTIONS:: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: Theory of Structural Stability (20CE1010) **Course & Branch**: M.Tech - SE

Year & Sem: I-M.Tech & I-Sem **Regulation:** R20

UNIT –I
Beam Columns

1	Derive the differential equation for maximum deflection and maximum bending moment in case of beam column with couple forces at ends?	[L3][CO1]	**[12M]**
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?	[L3][CO1]	**[12M]**
3	Derive the differential equation for maximum deflection and maximum bending moment in Case of beam column with central load?	[L3][CO1]	**[12M]**
4	Derive the differential equation for beam columns with compressive force and distributed lateral load?	[L3][CO1]	**[12M]**
5	Derive the differential equation for maximum deflection and end slopes in case of beam column subjected to end couples?	[L3][CO1]	**[12M]**
6	Derive the differential equation for maximum deflection and maximum bending moment in case of beam column with built in ends?	[L3][CO1]	**[12M]**
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.	[L2][CO1]	**[12M]**
8	a) Derive differential equation for beam column? b) What are the approximate methods used in the stability analysis and discuss their merits.	[L3][CO1]	**[12M]**
9	Derive the differential equation for maximum deflection and end slopes in case of beam column subjected to clamped/ built in ends?	[L3][CO1]	**[12M]**
10	Find the maximum bending moment in a beam –column on simply support & when subjected to axial load P and concentrated lateral load Q.	[L1][CO1]	**[12M]**

Course Code: 20CE1010 **R20**

UNIT –II
Elastic Buckling of Bars

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.	[L1][CO2]	**[12M]**
2	Derive the effect of shear force on value of crippling load.	[L3][CO2]	**[12M]**
3	Explain buckling of bars with varying in cross section with a suitable example?	[L2][CO2]	**[12M]**
4	Derive Euler's column formula for elastic buckling of straight bars?	[L3][CO2]	**[12M]**
5	Derive expression for critical load in case of buckling of bars with intermediate compressive forces?	[L3][CO2]	**[12M]**
6	Derive the critical load in case of buckling of bars with effect of eccentric load?	[L3][CO2]	**[12M]**
7	Derive the crippling load in case of buckling of bars with distributed axial loading.	[L3][CO2]	**[12M]**
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.	[L2][CO2]	**[12M]**
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.	[L1][CO2]	**[12M]**
10	Derive the crippling load for buckling of: a) Bars with intermediate compressive forces b) Bars with distributed axial load.	[L3][CO2]	**[12M]**

Course Code: 20CE1010 **R20**

UNIT –III
Inelastic Buckling

1	a) Explain the Tangent Modulus and Reduced Modulus theories. b) Show that the reduced modulus of rectangular cross section.	[L2][CO1] [L2][CO1]	**[6M]** **[6M]**
2	Explain Reyliegh – Ritz method. Illustrate with a problem, its application with respect to the determination of critical load of a compressive member.	[L2][CO3]	**[12M]**
3	a) Briefly discuss buckling of straight bar column. b) Differentiate between elastic buckling & inelastic buckling.	[L1][CO1] [L1][CO1]	**[6M]** **[6M]**
4	Explain reduced modulus theory and its assumptions and also derive critical load of double modulus theory.	[L2][CO1]	**[12M]**
5	Derive the reduced modulus of rectangular section.	[L3][CO1]	**[12M]**
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.	[L2][CO1] [L2][CO1]	**[6M]** **[6M]**
7	Explain Galerkin method. Illustrate with a problem, its application with respect to the determination of critical load of a compressive member.	[L2][CO3]	**[12M]**
8	Derive the critical load mathematical of stability problem using Timoshenko method.	[L3][CO3]	**[12M]**
9	Explain the various methods for calculating crippling load for buckling of bars in mathematical treatment of stability problems.	[L2][CO3]	**[12M]**
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.	[L1][CO3] [L1][CO3]	**[6M]** **[6M]**

Course Code: 20CE1010 **R20**

UNIT –IV
Torsional Buckling

1	Explain non uniform torsion of thin walled bars of open cross section with neat sketches.	[L2][CO4]	**[12M]**
2	Derive the expression for pure torsion of thin walled bars of open cross section.	[L3][CO4]	**[12M]**
3	Derive lateral buckling of simply supported beam of narrow rectangular section.	[L3][CO4]	**[12M]**
4	Briefly describe torsional buckling, lateral buckling and inelastic buckling.	[L1][CO4]	**[12M]**
5	Derive the question for the warping displacement for any bar of thin walled open section subjected to pure torsion.	[L1][CO4]	**[12M]**
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.	[L2][CO4]	**[12M]**
7	(a) Explain torsional buckling. (b) Explain thin walled bars of open cross section by pure torsion.	[L2][CO4] [L2][CO4]	**[6M]** **[6M]**
8	Derive the crippling load for a simply supported beam of narrow rectangular cross section subjected to lateral buckling.	[L3][CO4]	**[12M]**
9	(a) Briefly describe torsional buckling, lateral buckling and inelastic buckling. (b) Discuss the stability of plates under in plane and transverse loading.	[L1][CO5]	**[12M]**
10	Write a short note on torsional buckling and also explain pure torsion of thin walled bars of open cross section.	[L1][CO4]	**[12M]**

Course Code: 20CE1010 **R20**

UNIT –V
Lateral Buckling of Simply Supported Beams

1	Derive the crippling load for simply supported beam of rectangular cross section subjected to pure bending.	[L3][CO6]	**[12M]**
2	Derive the critical value of the compressive force for buckling of simply supported rectangular plates uniformly compressed in one direction.	[L3][CO5]	**[12M]**
3	Derive the critical value of the compressive force for buckling of simply supported rectangular plates uniformly compressed in two direction.	[L3][CO5]	**[12M]**
4	Derive the expression for critical moment for a simply supported rectangular beam subjected to pure bending.	[L3][CO6]	**[12M]**
5	Derive the expression for extreme fibre stress at buckling for a simply supported rectangular beam subjected to pure bending.	[L3][CO5]	**[12M]**
6	Derive the critical value of the compressive force for buckling of simply supported rectangular plates uniformly compressed using any direction method.	[L3][CO6]	**[12M]**
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.	[L3][CO6]	**[12M]**
8	Write short notes on a) Determine of allowable stress. b) Built up columns.	[L1][CO5]	**[12M]**
9	Write short notes on a) Creep buckling b) Orthogonality relation c) Pure bending	[L1][CO4]	**[12M]**
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.	[L1][CO5]	**[12M]**

PREPARED BY:
R. NANDA NAIK
Assistant Professor/Civil