PVP 23

Code: 23CE3302

II B.Tech - I Semester – Regular Examinations - DECEMBER 2024

STRENGTH OF MATERIALS
(CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Define elasticity and plasticity in the context of material behavior.	L1	CO1
1.b)	Define Factor of Safety.	L1	CO1
1.c)	What is a point of contraflexure in a beam?	L1	CO2
1.d)	What is the relationship between shear force and bending moment at a section of a beam?	L2	CO2
1.e)	Mention the assumptions for theory of simple bending.	L1	CO3
1.f)	Define polar moment of inertia, and why is it important in torsion.	L1	CO3
1.g)	Define the slope and deflection of a beam.	L1	CO4
1.h)	State the moment area method for calculating the deflection of beams.	L1	CO4
1.i)	Define the term "crippling load" in columns.	L1	CO5
1.j)	Define the radial stress in a thick cylindrical shell.	L1	CO5

PART – B

			BL	CO	Max. Marks
		UNIT-I			
2		Derive the relationship between the elastic constants: Young's modulus, Shear modulus, and Bulk modulus.	L2	CO1	10 M
		OR			
3		Explain the stresses induced in a bar of varying section under axial load. Derive the formula for the stress distribution.	L2	CO1	10 M
		UNIT-II			
4		Explain the significance of the point of contraflexure in beam analysis and how it is determined in different types of beams-simply supported, cantilever and overhang beams.	L2	CO2	10 M
		OR			
5		A simply supported beam of length 10 m is subjected to two point loads of 20 kN and 30 kN placed at 2 m and 7 m from the left support, respectively. Calculate the reactions at the supports, and draw the S.F. and B.M. diagrams for the beam.	L4	CO2	10 M

UNIT-III				
6	A T-section with a flange width of 150 mm, flange thickness of 20 mm, web height of 300 mm, and web thickness of 15 mm, derive the shear stress distribution across the section when subjected to a shear force of 40 kN. Also Calculate the maximum bending stress when subjected to a bending moment of 100 kNm.	L3	CO3	10 M
OR				
7	A hollow circular shaft with an external diameter of 250 mm and an internal diameter of 150 mm is subjected to a torque of 20 kNm. Calculate the shear stress at the inner and outer surfaces of the shaft. Take G = 80GPa.	L3	CO3	10 M
UNIT-IV				
8	Using the double integration method, derive the expression for the deflection curve of a simply supported beam of length 'L' subjected to a point load 'P' at its center. Determine the maximum deflection and the slope at the supports.	L3	CO4	10 M
OR				
9	A cantilever beam subjected to a couple 'M' at the free end, calculate the slope and deflection at the free end by using moment area method.	L3	CO4	10 M

UNIT-V				
10	A steel column of length ‘L’, with both ends fixed is subjected to an axial load ‘P’, and a lateral load ‘W’ acting at its midpoint. Using the Secant formula, determine the maximum stress in the column. Assume any data if necessary.	L3	CO5	10 M
OR				
11	A cylindrical shell with a diameter of 1.5 meters, Length 2 meters and a wall thickness of 12 mm is subjected to an internal pressure of 1.5 MPa. Calculate the changes in diameter and volume. Take E = 180GPa and poison’s ratio = 0.28.	L3	CO5	10 M