

ROLL No:

--	--	--	--	--	--	--	--	--	--	--	--

Total number of pages:[2]

Total number of questions:06

B.Tech. || ME || 3rdSem

STRENGTH OF MATERIALS 1

Subject Code:BTME-301/BTME 301A

Time allowed: 3 Hrs

Max Marks: 60

Important Instructions:

- All questions are compulsory
- Assume any missing data

PART A (2×10)

All COs

Q. 1. Short-Answer Questions:

- (a) Define beam. What are the various types of beams ?
- (b) What is flexural rigidity and Torsional rigidity ?
- (c) Differentiate between true stress and normal stress.
- (d) Relate slope, deflection, shear force and load with Bending moment.
- (e) Explain angle of twist and radius of curvature as used in torsion equation.
- (f) What is critical load and slenderness ratio in buckling of columns?
- (g) Write Rankine Gordon Formula.
- (h) Explain equivalent hinged length as applied to columns.
- (i) What is poisson's ratio ?
- (j) What are principal planes and angle of obliquity?

PART B (8×5)

CO2

Q. 2. Derive Bending equation stating all assumptions.

OR

Derive Torsion equation stating all assumptions.

Q. 3. Explain Macaulay's method for finding slope and deflection taking a suitable example. CO3

OR

Draw shear force and bending moment diagram for a beam 6m in length, simply supported at ends and carrying point loads of 10kN and 20kN at a distance of 1m from both ends.

5

Q. 4. A 1.5m long column has a circular cross section of 5 cm diameter. One of the ends of the column is fixed in direction and position and the other end is free. Taking the factor of safety as 3, calculate the safe load using: CO5

- Rankine Gordon formula, taking yield stress = 56 KN/cm² and $\alpha = 1/1600$ for pinned ends.
- Euler's formula; Young's modulus for Cast Iron is 120 GPa.

OR

Derive the relation for critical load for a strut fixed at both ends stating assumptions for Euler's theory.

Q. 5. A concrete column of 400mm by 400mm size is reinforced with 6 steel bars of 20mm diameter each. Calculate the safe load that the column can carry if the allowable stress in concrete is 4.0 MPa and Young's modulus of elasticity for steel is 15 times that for concrete. If the column supports an axial load of 600kN, what is the load shared by concrete and steel bars. CO1

OR

Explain Thermal stress.

A rod is 2m long at a temperature of 10°C. Find the expansion of the rod when the temperature is raised to 80°C. If this expansion is prevented, then find the stress in the material of the rod. Take $E = 100\text{GPa}$ and $\alpha = 0.000012 / ^\circ\text{C}$.

Q. 6. Derive the relation between the three moduli of elasticity. CO4

OR

In a two dimensional problem, the stresses at a point are $\sigma_x = 100\text{MPa}$, $\sigma_y = 60\text{MPa}$. If the Principal stress is limited to 150 MPa, find the value of shear stress τ_{xy} . Also find the inclination of the Principal planes and the magnitude of maximum shear stress.