



Term Evaluation (Even) Semester Examination March 2025

Roll no.

Name of the Course: B.Tech-Civil Engineering

Semester: IV

Name of the Paper: Structural Analysis

Paper Code: TCE- 402

Time: 1.5 hour

Maximum Marks: 50

Note:

- (i) Answer all the questions by choosing any one of the sub-questions
- (ii) Each question carries 10 marks.

Q1.

CO 1 (10 Marks)

a. Using moment area method, determine the mid-span deflection in a simply supported beam of span 'L', when it is subjected to a udl throughout the span.

OR

b. A fixed beam with a span of L carries a central concentrated load P. Derive the expression for the fixed-end moments at both supports and determine their values for $P=30\text{kN}$ and $L=4\text{m}$

Q2.

CO 1 (10 Marks)

a. A cantilever of length L is carrying a point load of W KN at a distance of 'a' from the fixed end. Calculate Slope at the free end and deflection at the free end.

OR

b. A simply supported beam AB of span 4m carries a point load of 100KN at its center C. The values of I for the left half is $1 \times 10^8 \text{ mm}^4$ and for the right half portion I is $2 \times 10^8 \text{ mm}^4$. Find the slopes at the two supports and deflection under the load using conjugate beam method. Take $E=2 \times 10^5 \text{ N/mm}^2$

Q3.

CO 1 / CO 2 (10 Marks)

a. A fixed beam of span L is subjected to a uniformly distributed load (UDL) of intensity 'w' over its entire span. Determine the fixed-end moments at both supports and determine their values for $L=6\text{m}$ and $w=10\text{kN/m}$. **CO 1**

OR

b. Compare the strain energies of the following two shafts subjected to the same maximum shear stress in torsion: **CO 2**

- i) A hollow shaft having outer diameter n times the inner diameter
- ii) A solid shaft

Masses, lengths and materials of the two shafts are the same.

Q4.

CO 2 (10 Marks)

a. A beam 4m in length is simply supported at the ends and carries a uniformly distributed load of 6kN/m length. Determine the strain energy stored in the beam. Take $E=200\text{GN/m}^2$ and $I=1440 \text{ cm}^4$

OR

b. A beam of length l simply supported at the ends is loaded with a point load W at a distance 'a' from one end. Assuming that the beam has constant cross-section with moment of inertia I and young's modulus E, find the strain energy of beam and hence find the deflection under the load. Stain energy due to shearing is neglected.



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CO 2 (10 Marks)

Q5.

- a. A cantilever of length L is carrying a point load of W KN at a distance of ' a ' from the fixed end. Calculate Slope at the free end and deflection at the free end using Castigliano's method.

OR

- b. A steel bar 4cm by 4cm in section, 3m long is subjected to an axial pull of 128kN. Taking $E=2 \times 10^5$ N/mm² calculate the alteration in the length of the bar. Calculate also the amount of energy stored in the bar during the extension.