

FOURTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/
TECHNOLOGY—OCTOBER, 2012THEORY OF STRUCTURES-II
(Common for CE, AR, EN, QS and WR)

[Time : 3 hours

(Maximum marks : 100).

PART—A

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. What is meant by the term moment of resistance of a beam ?
2. What is the condition to avoid tension in the masonry at the base of the dam ?
3. Sketch the typical shape of the bending moment diagram for a fixed beam with a u.d. load for the entire span.
4. A fixed beam and a simply supported beam having equal spans is loaded with a u.d load of equal intensity for the entire span. What will be the ratio between the deflections ?
5. Explain the term stiffness factor. (5×2=10)

PART—B

II Answer any five of the following. Each question carries 6 marks.

1. The depth of an I- beam is 280 mm. Its position of neutral axis is at a depth of 120 mm from the top edge. Sketch the bending stress distribution diagram. Take B.M = 70 kNM and $I = 200 \times 10^6 \text{ mm}^4$.
2. The maximum shear force in a rectangular beam is 20 kN. The cross sectional area of the beam is $45 \times 10^3 \text{ mm}^2$. Sketch the shear stress distribution diagram.
3. By using Mohr's theorem, derive the relations for the maximum deflection in the simply supported beam of span 'l' acted upon by a point load 'W' at the centre.
4. A beam 5 m long, simply supported at its ends carry a point load 'W' at its centre. If the slope at the ends of the beam is not to exceed 1° , find the deflection at the centre of the beam.
5. A continuous beam ABC with simple end supports is having spans $AB=BC=3 \text{ m}$. It is applied with a UDL of 8 kN/m for the entire length. Calculate the support moments.
6. Sketch and explain the direct and bending stress distribution diagram at the base of a column due to eccentric load.
7. Calculate the horizontal water pressure acting on a concrete dam of trapezoidal section, with the following data. Locate its point of action also.
Water face — vertical, Height — 16m, Base width — 8m, Top width — 3 m.
Water level coincides with the top of the dam. (5×6=30)

PART—C

Marks

(Answer one full question from each unit. Each question carries 15 marks.)

UNIT—I

- III (a) A rectangular beam 100 mm wide is subjected to a maximum shear force of 150 kN. Find the depth of the beam, if the maximum shear stress is 3.00 mPa. 6
- (b) A timber beam (75 × 250 mm) in cross section spans 2 m between simple supports. What safe UD load the beam can carry, if the permissible bending stress is 8 N/mm²? For the calculated safe UD load, what will be the average and maximum shear stress in the section near supports? 9

OR

- IV (a) A timber joist is 100 mm wide and 200 mm deep is used as a cantilever of length 2 m. What is the maximum concentrated load that the beam can carry at its free end in addition to its self weight of 0.2 kN/m so that the maximum bending stress is not to exceed 6 N/mm²? 8
- (b) A beam of I section 400 × 200 mm has a web and flange thickness of 20 mm. Calculate the shear stresses across the section and sketch the diagram. The shear force at the section is 300 kN. Take $I = 3.668 \times 10^8 \text{ mm}^4$. 7

UNIT—II

- V (a) A rectangular column 200 mm wide and 150 mm thick is carrying a vertical load of 120 kN at an eccentricity of 50 mm in a plane bisecting the thickness. Determine the maximum and minimum intensities of stress in the section. 8
- (b) A beam of span 6 m is fixed at both ends. It is loaded with point loads of 10 kN each at a distance of 2 m and 4 m from LHS. By equating the areas of μ diagram and μ' diagram, find the magnitudes of fixing moments at the ends. 7

OR

- VI (a) What are the advantages of fixed beam over simply supported beams? 6
- (b) A concrete dam of rectangular section 15 m high and 6 m wide contains water up to a height of 13 m. Draw the pressure diagram at the base. Assume weight of water and concrete as 10 kN/m³ and 25 kN/m³ respectively. 9

UNIT—III

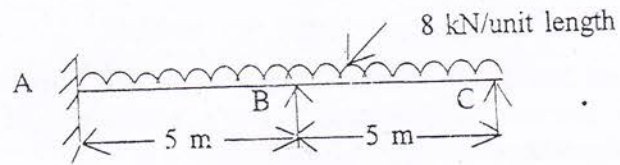
- VII (a) Define the terms slope and deflection in beams. 5
- (b) A cantilever of span 'l' is acted upon by a point load 'W' at a distance 'l₁' from fixed end. By using Mohr's theorem deduce an expression for the slope and deflection for the cantilever. 10

OR

- VIII (a) A fixed beam of span 6 m applied with a uniformly distributed load of 10 kN/m over the entire span. If $I = 5 \times 10^8 \text{ mm}^4$ and $E = 1 \times 10^7 \text{ N/mm}^2$, find the fixing moments and the deflections at the centre. 5
- (b) A simply supported beam of span 'l' is acted upon by a U.D. load of 'W' per unit length for the entire length. Derive an equation for slope at any point by using double integration method. 10

UNIT—IV

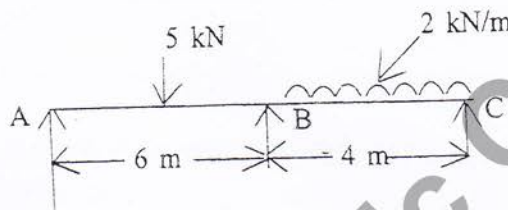
- IX A continuous beam ABC is given in the figure. By using theorem of three moments prepare the bending moment diagram for the beam.



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OR

- X Determine the moments over the beam ABC shown in figure and draw the bending moment diagram. Use moment distribution method.



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UNIT—IV

- IX (a) Explain the working principle of siphon. List any four uses of siphon. 7
- (b) Determine the most economical cross section of a trapezoidal channel to carry $3\text{m}^3/\text{sec}$ if bed slope is 1 in 1100, side slope is 1 V to 2H and $C = 35$. 8

OR

- X (a) Find the head loss due to friction using Darcy's and Chezy's formula in a pipe of 150 mm diameter, 300 m long, Darcy's coefficient of friction = 0.01 and water flowing with a velocity of 2.5 m/sec. 8
- (b) Derive the conditions for the most economical cross section of a rectangular channel. 7

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