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FOURTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY—MARCH, 2013

THEORY OF STRUCTURES–II

(Common for CE, AR, EN, QS and WR)

[*Time* : 3 hours

(Maximum marks : 100)

PART—A

(Maximum marks : 10)

Marks

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

1. What is meant by the term 'Neutral Axis' ?
2. Point out the position of maximum shear stress in the cross-section of a beam with an I-shape.
3. What is the condition to avoid tension in the masonry of a dam, at its base ?
4. Mention the relation for maximum deflection at the centre of a simply supported beam, with a uniformly distributed load, for the entire span, with explanation of the terms.
5. Sketch the typical shape of the fixing moment diagram, for a continuous beam ABC, with spans AB and BC, the support A, being fixed and B and C are simply supported. (5×2=10)

PART—B

(Maximum marks : 30)

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

1. Calculate the 'section modulus' of rectangular and circular sections and deduce from the above the section moduli values of the respective hollow sections.
2. In a symmetrical I-beam, the following data are available. Width of flange- 300 mm, thickness of web 15 mm. Shear stress at the bottom of flange- 2 N/mm^2. The maximum shear stress is 50 N/mm^2. Sketch the shear stress distribution diagram for the top half of the beam cross-section.
3. Prove that the limit of eccentricity at the base of a column with rectangular section, under eccentric loading is b/6.
4. List out the advantages of a fixed beam over a simply supported beam.
5. A beam, 5 m long simply supported at its ends, carries a point load W, at its centre. If the slope at the ends of the beam is not to exceed, 1°30′, find the deflection, at the centre of the beam.

Marks

6. By using Mohr's theorems, derive the relations for the slope and deflection, for a cantilever, with a u.d. load, for the entire span.

7. A continuous beam ABC with simple end supports, is having spans AB = BC = 3 m. It is applied with point loads of 10 kN. each, at the middle of each span. Calculate the support moments. Take $I_1 = I_2$. (5×6=30)

PART—C

(Maximum marks : 60)

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

UNIT—I

III (a) Derive the fundamental bending formula, for the cross-section of a loaded beam. 9

(b) A flitched beam consists of timber joist 100 mm wide and 200 mm depth, strengthened by a steel section 15 mm thick and 200 mm deep, at one side of the joist. Determine the total moment of resistance of the beam, if the allowable stress in timber joist is 7.5 N/mm² and that of steel is 150 N/mm². 6

OR

IV (a) A beam of rectangular cross-section is 200 mm wide and 350 mm deep. If the section is subjected to a maximum shear force of 30 kN, find the maximum shear stress and sketch the shear stress distribution along the depth of the beam. 6

(b) A beam of I-section (400 × 200) mm, has a web and flange thickness of 20 mm. Calculate the maximum shear stress across the section and sketch the shear stress distribution across the section of the beam, if it carries a shearing force of 300 kN, at a section. 9

UNIT—II

V (a) Derive the relations for maximum and minimum stress intensities at the base of a column with eccentric loading. 8

(b) Calculate the fixing moment values of a fixed beam, with a span of 4 m and carrying a point load of 20 KN, at its centre. Draw the S.F. and B.M. diagrams also. 7

OR

VI (a) What are the two conditions used to calculate the fixing moment values of a fixed beam ? 3

(b) A trapezoidal masonry dam is of 18 m height. The dam is having water upto a depth of 15 m, on its vertical side. The top and bottom width of the dam are 4 m and 8 m respectively. The weight density of the masonry is given as 19.62 kN/m³.

Determine :

(i) The resultant force on the dam per metre length.

(ii) The point where the resultant cuts the base; and

(iii) The maximum and minimum stress intensities at the base. 12

Marks

UNIT—III

VII (a) A simply supported beam of span l carries a uniformly distributed load of w kN/m, for the whole span. Derive the expressions for its maximum slope and deflection by using double integration method. 10

(b) A beam of uniform section of (200 × 300) mm is simply supported at its ends. It carries a u.d. load of 9 kN/m, over the entire span of 5 m. Find the maximum deflection. Take $E = 1 \times 10^4$ N/mm^2. 5

OR

VIII (a) A cantilever of span l is acted upon by a point load w at a distance of l, from the fixed end. Using moment – area method, derive the relations for the maximum slope and deflection of the beam. 9

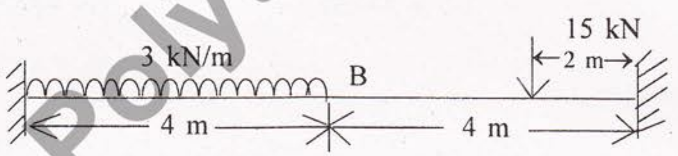
(b) A fixed beam of span 6 m carries a uniformly distributed load of 10 kN/m, over the entire span. If $I = 5 \times 10^{-4}$ m^4. and $E = 1 \times 10^7$ kN/m^2, find the fixing moments at the ends and the deflection at the centre. 6

UNIT—IV

IX A continuous beam ABC of uniform section with spans AB and BC as 4 m each is fixed at A and simply supported at B and C. It carries a uniformly distributed load of 6 kN/m, throughout the length. Draw the bending moment diagram for the beam. 15

OR

X Evaluate the bending moment values of the beam, shown in the figure by 'moment distribution method' and draw the bending moment diagram.



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