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(REVISION — 2010)

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FOURTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY — MARCH, 2015

THEORY OF STRUCTURES – II

[Common for CE, AR, EN, QS and WR]

[*Time* : 3 hours

(Maximum marks : 100)

Marks

PART—A

(Maximum marks : 10)

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

1. Briefly explain the term 'modulus of rupture'.
2. Sketch the shear stress distribution for : (i) C-Section (ii) I-Section.
3. What do you understand by eccentric loading in a column ?
4. Explain with examples 'statically indeterminate beams'.
5. Define stiffness factor. (5×2=10)

PART—B

(Maximum marks : 30)

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

1. A timber beam of 150mm wide and 240mm deep is used as a cantilever of length 4m. What is the maximum concentrated load it can carry at its end in addition to its self weight so that the bending stress does not exceed 7N/mm^2? Unit weight of timber is 6kN/m^3.
2. A beam of T section with flange 250mm × 30mm and web 40mm × 280mm is subjected to a shear force of 20kN. Find the maximum shear stress intensity and plot shear stress distribution diagram.
3. A short column of external diameter 'D' and internal diameter 'd' carries an eccentric load 'P'. Find the maximum eccentricity of the load that cannot produce tension in the cross section.
4. Explain the conditions for the stability of a dam or a retaining wall.
5. A cantilever beam of uniform flexural rigidity and 6m span carries a point load of 100kN at its mid span, together with a uniformly distributed load of 10kN/m run from the mid span till free end. Assuming EI = 40000kNm^2, determine slope and deflection at the centre of the span using moment area method.

Marks

6. A simply supported reinforced concrete rectangular beam of span 3m is carrying a uniformly distributed load of 8kN/m over the entire span. If the permissible bending stress is $7N/m^2$ and the allowable deflection is 10mm, find the required width and depth of the section. Take $E = 1 \times 10^4 N/mm^2$.

7. Four members OA, OB, OC and OD meet at joint O. The ends A, C and D are fixed and the end B is hinged. The length of the members OA = 2m, OB = 2m, OC = 2m and OD = 2.2m. All the members are of same material and same moment of interia. If a moment 15kNm is applied at the joint O, find the values of distributed moments. (5×6=30)

PART—C

(Maximum marks : 60)

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

UNIT—I

III (a) Define modulus of section. Find the section modulus for a beam of cross section 'b × d'. 6

(b) A timber beam 100mm wide and 150mm deep supports a uniformly distributed load over a span of 2m. If the safe stress are $28N/mm^2$ longitudinally and $2N/mm^2$ in transverse shear, calculate the maximum load which can be supported by the beam. 9

OR

IV (a) A beam of size 25mm × 25mm is capable of carrying the maximum central load of 2500N on a simply supported span of 600mm. The beam of same material but of size 25mm × 100mm is used as a cantilever of span 1500mm. Determine the maximum value of point load W that can be placed at the free end of this cantilever. 8

(b) A T beam of flange 200mm × 50mm and web 50mm × 200mm is subjected to a vertical shear force of 100kN. Calculate the shear stress at the neutral axis and at the junction of the web and the flange. Moment of inertia about the horizontal neutral axis is $1.134 \times 10^8 mm^4$. 7

Marks

UNIT—II

V (a) Explain :

(i) Limit of eccentricity for columns.

(ii) Core or kernel of a section. 6

(b) A fixed beam of span 4m is carrying a uniformly distributed load of 10kN/m through out the span. Draw the shear force and bending moment diagrams and calculate its maximum deflection if EI = 3000kNm^2. Also find out the positions of points of contraflexure. 9

OR

VI (a) A concrete dam of rectangular section 15m high and 6m wide contain water upto a height of 13m. Find :

(i) Total pressure per metre length of the dam.

(ii) The point where the resultant thrust cuts base.

(iii) The maximum and minimum intensities of pressure at the base.

Assume weight of concrete as 25300N/m^3. 8

(b) A beam of length 8m fixed at both ends carries a central point load of 24kN. Determine the fixing couples at the ends and draw shear force and bending moment diagrams. Find the maximum central deflection if the flexural rigidity of the beam is 50×10^9 kNmm^2. 7

UNIT—III

VII (a) State and prove Moment area theorems. 9

(b) A beam 5m span is simply supported at its ends. It carries a uniformly distributed load of 10kN/m over the entire span. In addition to the uniformly distributed load it carries a point load of 20kN at its mid span. Find out the maximum slope and deflection in the beam. Take E = 2×10^5N/mm^2 and 1 = 7.5×10^7mm^4. 6

OR

VIII (a) A rectangular beam of span 2m and cross section 100mm × 200mm is simply supported at its edges. The beam is subjected to a uniformly distributed load of 10kN/m for the entire span. Find the maximum slope and deflection. Take E = 2×10^4N/mm^4. 6

(b) A simply supported beam AB of span 9m is subjected point loads of 40kN and 30kN at 2m and 6m from end A. If E = 200kN/mm^2 and I = 16×10^8mm^4, using Macaulay's method, calculate :

(i) Deflection under the loads

(ii) Maximum deflection in the beam

(iii) Slope at A. 9

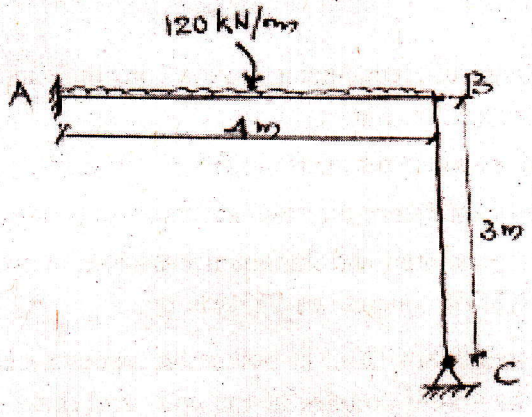
Marks

UNIT—IV

IX A continuous beam ABC is such that the end A is fixed while B and C are freely supported. The span AB = 6m and carries a uniformly distributed load of 30kN/m over the entire span. Find the support moments. Also draw the shear force and bending moment diagrams. 15

OR

X A loaded frame is shown in the figure. The end A is fixed and C is hinged. Draw bending moment diagrams. Assume members AB and BC having same flexural rigidity.



15