TED (10)–3025

(REVISION—2010)

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FOURTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY—MARCH, 2012

THEORY OF STRUCTURES—II

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

[*Time* : 3 hours

(Maximum marks : 100)

Marks

PART—A

(Answer *all* questions in one or two sentences. Each question carries 2 marks.)

I 1. What is meant by the term 'Moment of Resistance' of a beam ?

2. Briefly explain the term 'Eccentric loading' in a column.

3. Define the term 'Stiffness' of a loaded beam.

4. Point out the positions of maximum slope and deflection of a cantilever, with a combination of point and U.D. loads.

5. Explain the term 'Stiffness factor'. (5x2=10)

PART—B

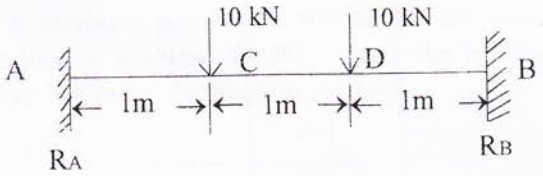
(Answer *any five* of the following questions. Each question carries 6 marks.)

II 1. Draw the bending stress distribution diagram, with salient values of a simply supported beam of span 3m, with a central point load of 20 kN. The depth of the beam is 200 mm. Take the value of I as 80 x 10^6 mm^4.

2. The maximum shear force in a rectangular beam is 20 kN. The cross sectional area of the beam is 45 x 10^3 mm^2. Sketch the shear stress distribution diagram.

3. Sketch and explain the direct and bending stress distribution diagrams, at the base of a column, due to eccentric load.

4. Calculate the fixing moment value of the fixed beam shown in the figure.



5. A simply supported beam, 4 m long, carries a u.d. load of 10 kN/m, for the entire span. Keeping the breadth of beam, as half the depth, find the measurements of the beam, so that the maximum deflection at the centre, is limited to 25 mm. Take E = 2 x 10^5 N/mm^2.

Marks

6. A fixed beam AB is 4m long and carries a point load of 70 kN, at its centre. I of the beam is 70 x 10^6 mm^4 and E = 2 x 10^5 N/mm^2. Find the fixed end moments and the deflection under the load.

7. 3 members of uniform cross section of lengths OA = 3m, OB = 4m and OC = 3 m meeting at O are hinged at A and C and fixed at B. Its moment of inertia are 400 mm^4, 300 mm^4 and 500 mm^4 respectively. Tabulate the distribution factor for the members and the distributed moments when a moment of 5000 kNm is applied at O.

(5x6=30)

PART—C

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

Unit – I

III (a) Explain the concept of 'Simple bending theory' of loaded beams. 7

(b) A beam of symmetrical section (200 x 400) mm is simply supported at the ends and carries a uniformly distributed load of 20 kN/m. over the entire span. Calculate the maximum permissible span, if the maximum bending stress permitted is 100 N/mm^2. 8

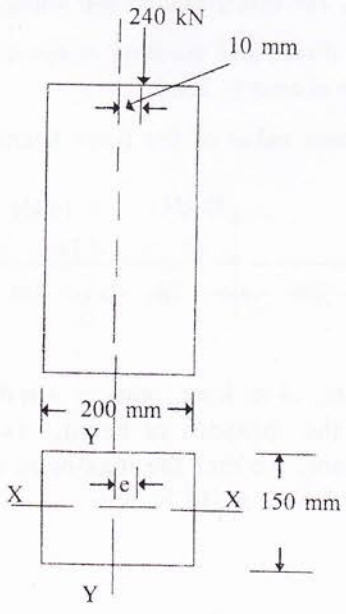
Or

IV (a) A rectangular beam 100 mm wide is subjected to a maximum shear force of 50 kN. Find the depth of the beam, if the maximum shear stress is 3.00 M.Pa. 6

(b) A timber beam (75 x 250 mm.) in cross section, spans 2 m, between the end simple supports. What safe uniformly distributed load, the beam can carry, if the permissible bending stress is 8 N/mm^2. For the calculated safe U.D. load, what will be the average and maximum shear stress values, in the section, near supports ? 9

Unit – II

V (a) A rectangular column of width 200 mm and of thickness 150 mm carries a point load of 240 kN, at an eccentricity of 10 mm as shown in the figure. Determine the maximum and minimum stresses on the section.



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Marks

(b) Calculate the fixing moment values of a fixed beam, with a span of 3.6m and carrying a uniformly distributed load 14 kN/m, for the entire span. Draw the S.F. and B.M. diagrams of the beam, under this loading. 7

OR

VI (a) Arrive at the maximum possible value of eccentricity in case of a circular section, so that only compressive stress is developing at the base of the column, under eccentric loading. 7

(b) A masonry trapezoidal dam 4 m high, 1 m wide at its top and 3 m wide, at the bottom retains water on its vertical face. Determine the lateral thrust of water, the weight of dam, the resultant force and the positions of all the above forces, when the reservoir is full. Density of masonry is 19.62 kN/m^3. 8

UNIT – III

VII (a) Derive the expressions for the slope and deflection of a simply supported beam, of span l, carrying a point load of W, at the centre, by using Mohr's theorems. 9

(b) Calculate the maximum deflection at the centre of a simply supported beam of span 4.2 m. when its maximum slope is 3°. 6

OR

VIII (a) A cantilever of length 2 m carries a point load of 20 kN at the free end and another of 30 kN, at its centre. If, E = 1 x 10^5 N/mm^2 and I = 1 x 10^8 mm^4, determine by moment-area method, the slope and deflection of the cantilever at the free end. 9

(b) A beam of uniform rectangular section 200 x 300 mm size is simply supported at its ends. It carries a uniformly distributed load of 9 kN/m, over the entire span of 5 m. If the value of E for the beam material is 1 x 10^4 N/mm^2, find the maximum deflection value.

Also, calculate the deflection of the beam, when its ends are transformed to fixed ones, without changing other conditions. 6

UNIT – IV

IX A continuous beam ABCD of uniform cross-section, is simply supported at all points. The spans AB, BC and CD all 4 m each. It is loaded with point loads of 10 kN and 12 kN at distances of 2 m and 6 m respectively, from the left end A. It carries a uniformly distributed load of 4 KN/m, for the span CD. Draw the B.M. diagram of the beam. 15

OR

X A continuous beam ABC, 8 m long rests on three simple supports A. B and C, such that AB = BC = 4m. It carries a point load of 4 kN, at the mid length of AB and a uniformly distributed load of 4 kN/m, for BC. Draw the bending moment diagram, of the beam by using the 'Moment distribution method'. 15
