TED (06)–4043 Reg. No. .....

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FOURTH SEMESTER DIPLOMA EXAMINATION IN CIVIL ENGINEERING—MARCH, 2012

THEORY OF STRUCTURES—II

[*Time* : 3 hours

(Maximum marks : 75)

PART—A

(Maximum marks : 15)

Marks

I Answer the following questions in one or two sentences :

1. Explain the word section modulus.
2. Draw the shear stress distribution diagram for a rectangular beam section and mark the maximum and minimum values.
3. Mention any two condition for the stability of a dam.
4. Define active earth pressure in case of a retaining wall.
5. Write the differential equation to determine deflection. Explain the terms used.
6. State the Mohr's theorem to findout the deflection at any section of a deflected beam.
7. What you mean by statically indeterminate beam ?
8. State Clapeyron's theorem of three moment of a continuous beam.
9. Define the term stiffness factor.
10. Write the equation for stiffness factor for a beam simply supported at both the ends and explain the notations used. (10×1½=15)

PART—B

(Maximum marks : 60)

(Answer *one* full question from each unit)

UNIT—I

II (a) Show that the neutral axis of a beam section always passes through its centroid. 4

(b) A 75 mm x 250 mm timber beam with its longer edge vertical has span 2m between simple supports. What safe uniformly distributed load the beam can carry if the permissible bending stress is 8 N/mm². For the calculated safe u.d.l. what will be the maximum shear stress in the section near support ? 8

OR

Marks

III (a) State the assumptions made in the theory of simple bending. 4

(b) A beam of I section 200 mm x 400 mm has a web and flange thickness 20 mm. Calculate the maximum intensity of 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. 8

UNIT—II

IV (a) Derive an expression for maximum and minimum intensities of stress, when a rectangular cross section is subjected to an eccentric loading. 4

(b) A masonry dam has a trapezoidal cross section. The height above the foundation is 62 m with its water face vertical. The width at the top is 4.5 m. Calculate the necessary minimum base width to ensure that no tension shall be developed when water is stored up to 60 m. Take weight of masonry as 22.6 kN/m^3 and weight of water as 9.81 kN/m^3. 8

OR

V (a) Derive the condition for no tension at the base of a masonry dam. 4

(b) A rectangular column 250 mm wide and 150 mm thick is carrying a vertical load of 12 kN at an eccentricity of 50 mm in a plane bisecting the thickness. Determine the maximum and minimum intensities of stresses in the section and sketch the stress distribution diagram. 8

UNIT—III

VI (a) Derive the relation between slope, deflection and radius of curvature. 6

(b) A simply supported beam of span 10 m is carrying a point load of 10 kN at a distance of 6 metres from the left end. If E = 200 GN/m^2 and I = 1000 x 10^6 mm^4, Determine :

1. Slope at the left end.
2. Deflection under the load.
3. Maximum deflection of the beam. 6

OR

VII (a) Derive the equation to find out the maximum slope and deflection of a simply supported beam of span 'l' carrying a u.d.l. of w/m over the whole span. Rigidity of the beam EI. 6

(b) A cantilever of span 2 m is carrying two point loads of 20 kN and 30 kN at distances of 1 m and 2 m respectively from the fixed end. Find out the maximum slope and deflection using moment area method. Take E = 200 GPa and I = 1.5 x 10^8 mm^4. 6

UNIT—IV

VIII (a) Derive expressions for finding out the fixing moments of a fixed beam carrying a central point load. Also determine the maximum deflection. 6

(b) A continuous beam ABC is simply supported over two spans AB and BC of 6 m and 5 m respectively. The span AB is carrying a u.d.l. of 20 kN/m and the span BC is carrying a point load of 50 kN at its midspan. Find the support moment and the reactions. 6

OR

Marks

IX (a) Proove Clapeyron's theorem of three moments for a continuous beam. 6

(b) A fixed beam of span 4 m is carrying a u.d.l. of 10 kN/m throughout the span. Draw bending moment diagram and calculate the maximum deflection, if $EI = 3000\ kN/m^2$. 6

UNIT—V

X A continuous beam ABC 12 m long is fixed at the ends 'A' and 'C' and supported at 'B' 6 m from A. It carries a u.d.l. of 2 kN/m for the entire span of AB and a point load of 12 kN at the centre of span B.C. Find the support moments and draw the shear force diagram and bending moment diagram by moment distribution method. 12

OR

XI Analyse the portal frame shown in figure by moment distribution method and sketch the BMD. All the members have the same flexural rigidity. 12