TED (10) 3025

(REVISION — 2010)

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FOURTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY — APRIL, 2017

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 section modulus ?
2. Sketch the shear stress distribution of a rectangular, I section and circular section.
3. Sketch the core details of a rectangular and circular column section for limit of eccentricity.
4. State Mohr's theorem for slope and deflection.
5. What is carry over moments ? (5 × 2=10)

PART — B

(Maximum marks : 30)

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

1. Define neutral axis, moment of resistance and write simple bending equation.
2. A timber joist is 150 mm wide and 240 mm deep is used as a cantilever of length 4m. What is the maximum concentrated load that it can carry at its free end in addition to its self-weight so that the bending stress not to exceed 7 N/mm^2 ? Take unit weight of timber as 6 kN/m^3.
3. What are the advantages of fixed beam ?
4. What are the conditions of stability of a dam or retaining wall ?
5. Derive the equation for slope and deflection of a simply supported beam carrying uniformly distributed load w for the whole span l. Also find the maximum slope and deflection by double integration method.

[15]

Marks

6. Using moment area principle find the maximum slope and deflection of a cantilever carrying a point load W at a distance a from the fixed end. The total span of the beam is l and $a < l$.

7. Define carry over factor, stiffness factor and distribution factor. (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) A wooden beam 2m long is simply supported at its ends and has a cross section 15cm wide and 60cm deep. It carries a UD lod of 90kN/m over the entire span. Calculate the bending stress at a point 20cm above the bottom of the beam and 60cm from left support. 7

(b) A timber beam of rectangular section is simply supported at its ends and carries a concentrated load at mid span. The maximum longitudinal stress 12N/mm² and maximum shear stress 1N/mm². Find the ratio of the span to depth of the beam. 8

Or

IV (a) If a simply supported beam section 100mm wide and 150mm deep carries a load of 5000 N/m run and the bending stress is not to exceed 110 N/mm², find the span of the beam. 7

(b) A 25cm × 7.5cm timber beam with its longer edge vertical, spans 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 uniformly distributed load what will be shear stress in the section near supports. 8

Unit — II

V (a) A short hollow pier of 1.2m square section outside and 1.0m square section inside is subjected to a direct load of 120kN along its outer edge point. Determine the final stresses at the base of the pier. Draw neat sketch of stress distribution diagram. 7

(b) A concrete dam of trapezoidal section having water in vertical face is 16m high. The base of the dam is 8m wide and top is 3 m wide. Find :

(i) The resultant thrust on the base per meter length of the dam (ii) the point where the resultant thrust cut the base and (iii) intensities of maximum and minimum stress across the base. Take the weight of concrete as 24 kN/m³ and the water level coinciding with the top of the dam. Draw also the stress distribution diagram below the base of the dam. 8

Or

Marks

VI (a) A fixed beam of 4m span is carrying a uniformly distributed load of 10kN/m over the entire span and a point load of 10kN at the mid span. Draw the shear force and the bending moment diagrams. 7

(b) A masonry retaining wall of trapezoidal section 8m high, 2 m wide at the top and 4m wide the bottom. The soil levels with the top of the retaining wall and soil face is vertical. Determine the maximum and minimum pressure intensities at the base of the wall. Take unit weight of soil 18 kN/m³, angle of repose 30° and unit weight of masonry 22kN/m³. 8

Unit — III

VII (a) A simply supported beam of span 4m and circular cross section having diameter 200 mm is loaded with 10 kN/m from the left support over a span of 2m and remaining 2m is free. Find the maximum deflection of the beam. Take E = 2 ×10⁴ N/mm². 7

(b) Find the maximum slope and deflection of the cantilever carrying two point loads of 10kN and 20kN at a distance of 1m and 3 m respectively from the left support. The total span of the beam is 3 m. Take E = 2 ×10⁴ N/mm² and I =3.375×10⁸mm⁴. 8

Or

VIII (a) Derive the equation for slope and deflection of a cantilever carrying uniformly distributed load over the whole span using moment area method. 7

(b) A cantilever beam of 3m length carries three point loads 15kN each at a distances 1m, 2m and 3m from the fixed end. Calculate the maximum slope and deflection in terms of flexural rigidity EI. 8

Unit — IV

IX Draw the shear force and bending moment diagrams of a continuous beam ABC having span lengths AB = 4m and BC = 4m. The span is carrying a point load of 20 kN at distance of 1 m from support A. The span BC carries a UD load of intensity 8kN/m. 15

Or

X A beam ABCD fixed at A and D and simply supported at B and C. The span AB is 3m and carry a point load of 8 kN at a distance of 1m from A with 1.5 I. The span BC, 4m carries a UD load of 5kN/m with 2I. The span CD is 4m with I and carry a point load of 4kN at centre. Analyse the beam by moment distribution method and draw bending moment diagrams. 15