TED (15/19) – 4014
(Revision – 2015/19)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL – 2024

THEORY OF STRUCTURES - II

[Maximum Marks : 100] [Time : 3 hours]

PART – A
(Maximum Marks : 10)

Marks

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

1. Define buckling factor.
2. Define eccentric load.
3. List any four statically indeterminate structures.
4. Define the strength criteria of beams.
5. Define carry over moment. (5x2=10)

PART – B
(Maximum Marks : 30)

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

1. A solid round bar of 2.5 m length with its both ends fixed has buckled under an axial load of 25 kN. Determine the buckling load if one end is hinged and other end is fixed.
2. Explain the classification of trusses.
3. A fixed beam of span 4 m carries a UDL of 25 kN/m over the entire length. Draw S.F and B.M diagrams and indicate the values.
4. Derive the formula for core of a hollow rectangular section.
5. Find the slope and deflection at free end of a cantilever carrying UDL throughout the span using Mohr's theorem.
6. A cantilever beam of 2 m length carries a point load of 20 kN at midspan. Find the slope and deflection at free end in terms of EI.
7. A continuous beam ABC consists of two span AB and BC of lengths 4 m and 6 m respectively. The span AB carries a point load of 40 kN at 2 m from A. Find the reactions at the supports by using theorem of three moments. (5x6=30)

PART – C
(Maximum Marks : 60)
(Answer **one full** question from each unit. Each full question carries 15 marks)

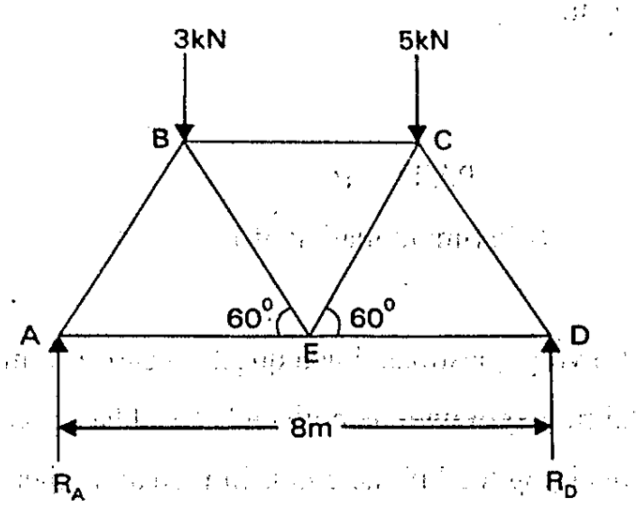
UNIT – I

III. (a) In an experimental determination of the buckling load for 12 mm diameter mild steel pin ended struts the following values were obtained

(i) Length 500 mm ; Load = 7.6 kN
(ii) Length 200 mm ; Load = 22 kN

From these observations, determine the two constants in the Rankine's formula. (7)

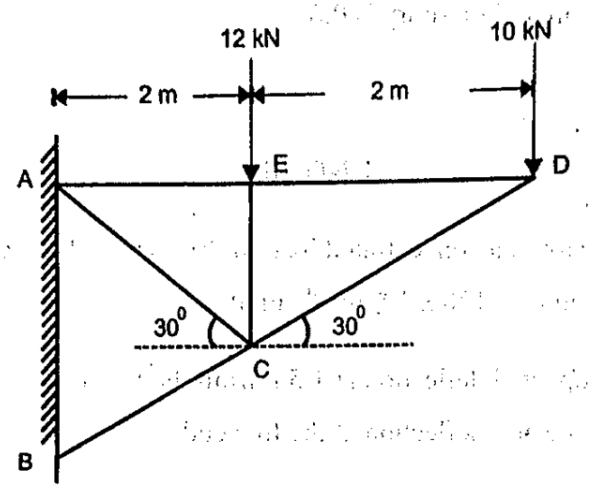
(b) Find the forces in all the members of the truss using method of joints. (8)



OR

IV. (a) A hollow cast iron column with hinged ends supports an axial load of 1000 kN. If the column is 6 m long and has an external diameter of 300 mm, find the thickness of the metal required. Use Rankine's formula taking constant $\alpha = \frac{1}{1600}$ and a working stress of 80 MPa. (7)

(b) Find the forces in all the members of the truss using method of joints. (8)



UNIT – II

V. (a) A concrete block 2 m x 2 m weighing 90 N is subjected to an eccentric load of 20 N. Determine the eccentricity of the load if maximum stress is equal to twice the minimum stress. (6)

(b) A masonry dam of trapezoidal section is 1.5 meters wide at top and 4 meters wide

at bottom. If the height of dam is 6 meters determine the maximum and minimum intensities of stress at the base when

(i) Reservoir is full (ii) Reservoir is empty (9)

OR

VI. (a) A steel solid circular rod carries a load of 100 kN acting at 20 mm away from the centre of gravity. Determine the diameter of the steel rod if the maximum stress is to be 43.5 N/mm^2. (6)

(b) A masonry retaining wall trapezoidal in cross section is 9 meters high and 1.5 m wide at the top and 4.5 m wide at bottom with a vertical face retaining earth upto its top. Weight of masonry is 22 kN/m^3 and that of earth is 18 kN/m^3. Angle of internal friction of the soil is 40°. Check the stability of the wall if the allowable pressure on the soil is 300kN/m^2. Coefficient of friction between the soil and masonry is 0.6. (9)

UNIT –III

VII. (a) A cantilever 3 m long carries a concentrated load of 30 kN at a distance 1.5 m from the fixed end. E = 200 kN/mm^2 and I = 120 x 10^6 mm^4. Find

(i) Slope and deflection at 1.5 m from the fixed end

(ii) Slope and deflection at the free end. (7)

(b) Derive the expression for slope and deflection at free end of a cantilever carrying a UDL throughout the span using double integration method. (8)

OR

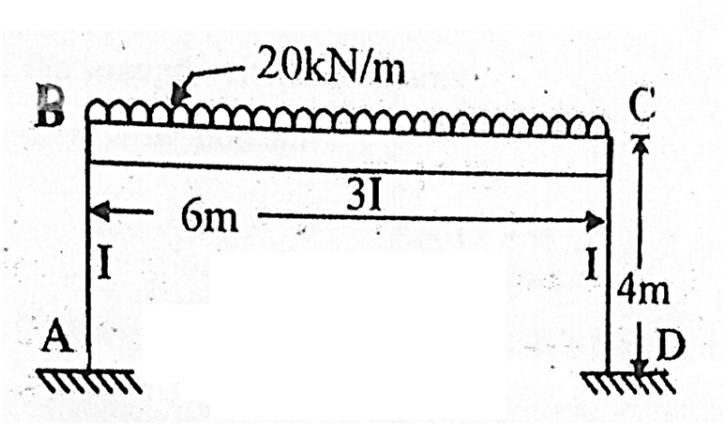
VIII. (a) A cantilever beam of length 2 m carries a point load of 2 kN at the free end and a uniformly distributed load 1 kN/m for a length of 1 m from the free end. Find the maximum deflection at the free end. Take E = 20 kN/mm^2, I = 66.67 x 10^6 mm^4. (7)

(b) Derive the expression for slope at ends and deflection at mid point of a simply supported beam carrying a UDL throughout the span using Macaulay's method. (8)

UNIT – IV

IX. (a) A continuous beam ABC of uniform section with span AB as 8 m and BC as 6 m is simply supported at A, B and C. The beam is carrying a uniformly distributed load of 10 kN/m throughout its length. Find the moments along the beam and the reactions at the supports. Also draw the BM and SF diagram and consider El is constant for both the spans. Use three moment theorem. (7)

(b) A portal frame ABCD shown below is loaded with a uniformly distributed load of 20 kN/m on the horizontal member. $I_{AD} = I_{CD}$ and $I_{BC} = 3I_{AD}$. Determine the end moments and draw the BM diagram using moment distribution method. (8)



OR

X. (a) A beam ABC, 7 metres long is continuous over two spans of AB = 3 metres and BC = 4 metres, all supports being at the same level. The beam is subjected to two point loads of 40 kN and 80 kN at 1.5 metres and 6 metres from left hand support A. Determine support moments and reactions. Also draw shear force and bending moment diagrams. Use three moment theorem. (7)

(b) A beam ABCD 9 m is long simply supported on supports A, B and C such that the span AB is 3 m, span BC is 4.5 m and the overhanging CD is 1.5 m. It carries a UD load of 15 kN/m in span AB and a point load of 10 kN at the free end B. $I_{BC} = 2I_{AB}$. Consider E as constant. Find the end moments and draw BM and SF diagram of the beam. Use moment distribution method. (8)

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