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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, NOVEMBER - 2024

THEORY OF STRUCTURES - II

[Maximum marks: 100] [Time: 3 Hours]

PART – A
Maximum marks: 10

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

1. Define equivalent length of a column.
2. List the checks to be made for stability analysis of dams.
3. Define statically indeterminate beams.
4. Define the stiffness criteria for beams.
5. Define distribution factor. **(5 x 2 = 10)**

PART – B
Maximum marks: 30

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

1. Derive Rankine's formula for crippling load from Euler's formula.
2. Describe the method of sections used to analyse simple determinate trusses.
3. Derive the formula for core of a hollow circular section.
4. Derive the condition for no tension to occur at the base of a dam section.
5. Find the slope and deflection at free end of a cantilever carrying point load at mid span using Mohr's theorem.
6. A cantilever beam of 2 m length carries a UDL of 20 kN/m through out the span. Find the slope and deflection at free end.
7. Define (i) Fixed end moments (ii) Unbalanced moments (iii) Distributed moments

(5 x 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 325 x 165 mm R.S.J is used as a strut 6 m long, one end is fixed and the other is hinged. Compute the crippling load by Rankine's formula. Compare this with

the load applied by Euler's formula. For what length of this strut with the two formulae gives the same crippling load. For the joist;

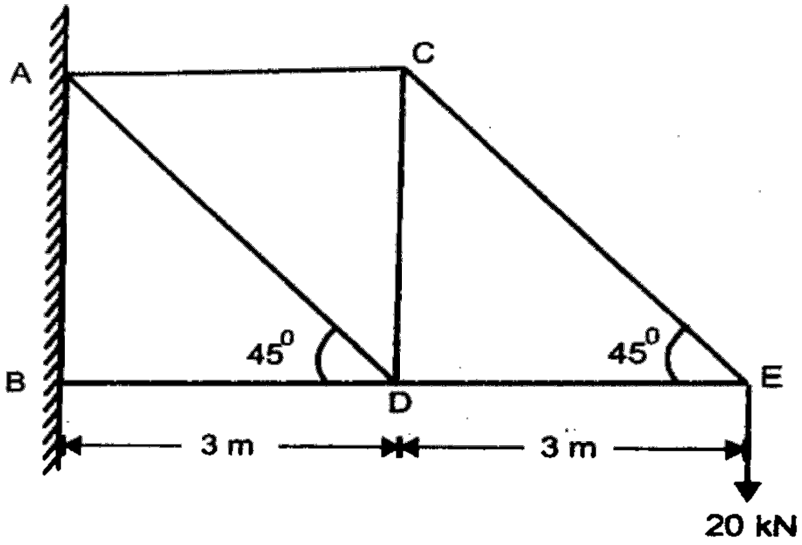
Area of C.S = 5490 mm^2 ;

I_{xx} = 98.746 x 10^6 mm^4 ;

Iyy = 5.108 x 10^6 mm^4 ; E for strut = 210kN/mm^2

F_c = 0.33kN/mm^2 ; $\alpha = \frac{1}{7500}$ (9)

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

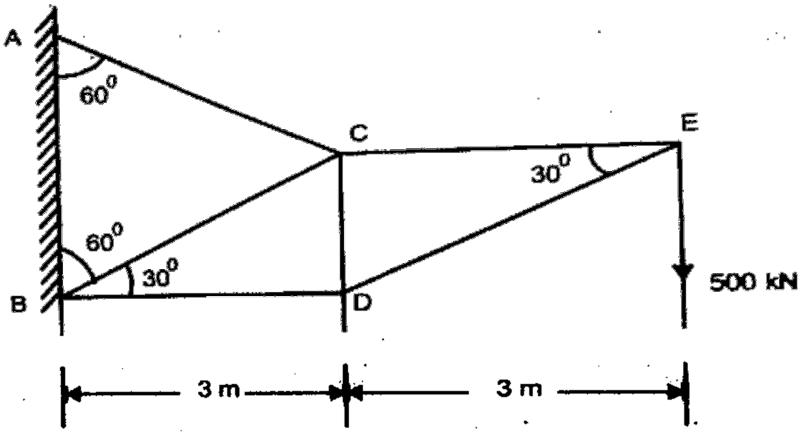


(6)

OR

IV. (a) Compare the safe loads for two circular columns of the same length, same material and equal areas of cross-sections. One of them being hollow with diameters ratio 2:1 and the other solid. In each case, one end is fixed and the other hinged, and factor of safety is the same. (6)

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



(9)

UNIT – II

V. (a) A short C. I. column of hollow square section has outer dimensions of 200 x 200 mm and inner dimensions of 120 x 120 mm. It is acted upon by a vertical compressive load at an eccentricity of 50 mm. Find the maximum load the column can carry if maximum stress in compression and tension are limited to 60 N/mm^2 and 3 N/mm^2 respectively. (6)

(b) A trapezoidal masonry dam 12 m high retains water on vertical side to its full height. The dam section has a rear batter of 1 in 4. Determine the top and bottom widths of the dam for no tension at the base. Density of masonry is 22 kN/m^3. (9)

OR

VI. (a) A short column of external diameter 30 cm and internal diameter 20 cm carries an eccentric load of 2000 kN. Find the greatest eccentricity of load which will not produce stress of opposite nature anywhere in the section. (6)

(b) A masonry retaining wall of trapezoidal section is 2 m wide at top and 6 m at base. Height of the wall is 12 m. It retains earth for the full height against vertical face. The earth is level with the top. Find the intensities of stress at the base.

Density of masonry = $24kN/m^3$
Density of earth = $18kN/m^3$
Angle of repose = 30^0 (9)

UNIT - III

VII. (a) A cantilever 2m long is loaded with a concentrated load of 1.0 kN at the free end and uniformly distributed load of 2 kN/m over a length of 1.2 m from the fixed end. If E = 11 kN/mm^2 and I = 66 x 10^6 mm^4. Calculate the deflection at the free end. (6)

(b) Derive the expression for slope and deflection at free end of a cantilever carrying a point load at free end using double integration method. (9)

OR

VIII. (a) A cantilever beam 3 m long carries a concentrated load of 10 kN at the free end and another point load of 20 kN at a distance of 1 m from the fixed end. Calculate the deflection at the free end given that E = 200 kN/mm^2 and I = 150 x 10^6 mm^4 (6)

(b) Derive the expression for slope at ends and deflection at mid point of a simply supported beam carrying a central point using Macaulay's method. (9)

UNIT – IV

IX. (a) A continuous beam ABC 8 m long consists of two spans AB = 3 m and BC = 5 m. The span AB carries, a U.D. load of 50 kN/m while the span BC carries a UD load of 30kN/m. Find the support moment at B and the reactions at the supports using three moment theorem. Sketch the S.F and B.M diagram. E1 is constant. (7)

(b) A portal frame ABCD of span 3 m and height 4 m is subjected to a UD load of 40 kN/m over the member BC The vertical members AB and CD are hinged in to the ground. Determine the end moments and draw the BM diagram. Consider E1 as constant. Use moment distribution method. (8)

OR

X. (a) A beam ABC is freely supported at A, B & C such that AB = 6 m and RC = 4 m Span AB carries a U.D. load of 50 kN/m while span BC carries a point load of 100 kN at 3 m from B. Sketch the S.F and B.M diagram and indicate the salient values. (7)

(b) A continuous beam ABC 10 m long simply supported on supports A, B and C at the same level. Span AB is 6 m long and a point load of 30 kN acts at a distance 2 m from A. Span BC is 4 m long and carries a UD load of 10 kN/m over the entire span. Determine the end moments and draw BM and SF diagrams. Use moment distribution method. (8)
