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

A22-03489

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/
COMMERCIAL PRACTICE –APRIL -2022.

THEORY OF STRUCTURES II

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

PART–A

(Max. Marks:10) Marks

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

1. Explain the disadvantages of Fixed beam.
2. Neatly sketch a trapezoidal gravity dam with waterface vertical, clearly showing the important forces and their relative positions.
3. List any two rules to be observed while using Macaulay's method for slope & deflection.
4. List down the limitations of Euler's formula for buckling.
5. Write down Clapeyron's Three moment theorem.

(5x2=10)

PART - B

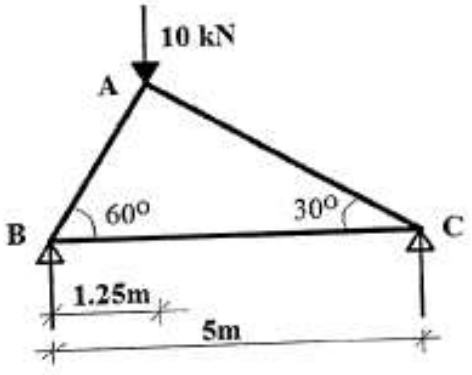
(Max. Marks: 30)

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

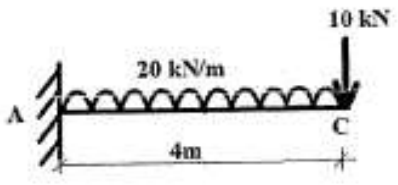
1. A mild steel tube of 25mm internal diameter, 32mm external diameter and length 3m is used as a strut. E=2x10^5 N/mm^2. Calculate Euler's crippling load for the following cases:

   (a) one end fixed and the other end hinged (b) one end fixed and other end free

2. Find the forces in members AB, BC and AC.



3. Draw and explain briefly the stress distribution diagrams in a short column subjected to eccentric loads for (a) Direct stress > Bending stress (b) Direct stress = Bending stress (c) Direct stress Bending stress.
4. Derive the limiting value of eccentricity for no tension in a circular hollow section of outer diameter D and inner diameter d.
5. Compute the maximum slope & deflection in a cantilever beam with a point load at the free end.
6. Find the slope at the free end of a cantilever beam shown below.
   Take EI=4x10^{13}Nmm^2.



7. Three members OA, OB & OC meeting at O, have fixed supports at A, B & C. Lengths OA, OB & OC are 3m, 4m and 5m, and their moments of inertia 400mm^4, 300mm^4 and 200mm^4 respectively. Determine the distribution factors and distributed moments in all the members if a moment of 4000kNm is applied at O.

(5x6 =30)

PART - C

(Max. Marks: 60)

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

UNIT I

III a) Determine the buckling load of a long column under different end conditions. (5)

b) A cast iron column of hollow cylindrical section 5m long with both ends fixed. The internal and external diameters of the section are 150mm & 200mm respectively. Rankine's constant = 1/1600. Ultimate crushing stress is 550 N/mm^2. Use factor of safety 8. Find the safe axial load on the column. (10)

OR

IV (a) A long column of solid circular section of 250mm diameter has the same cross sectional area as that of a hollow circular section of thickness 40mm. If all the other parameters are same for both columns, find the ratio of crippling load of solid section to that of hollow section. (8)

(b) An I-section is used as a column of length 5m, one end fixed and the other end hinged. Using Rankine's constant 1/7500 and ultimate crushing stress 315 N/mm^2, find the safe axial load for column if the factor of safety is 3. Area of the section is $4755mm^2$, $Ix=5131.6x10^4mm^4$, $Iy=334.5x10^4mm^4$. (7)

UNIT- II

V a) Determine the minimum basewidth of a rectangular gravity dam with waterface vertical for no tension to develop. Assume the dam is completely filled with water to the full height H. Take G as the specific gravity of the dam material. (7)

b) Briefly describe the conditions for the stability of a dam. Also list down the assumptions in Rankine's Earthpressure theory. (8)

OR

VI A concrete dam has its upstream face vertical and top width 3m. Its downstream face has a uniform batter. It stores water to a depth of 15m with a freeboard 2m. Calculate:

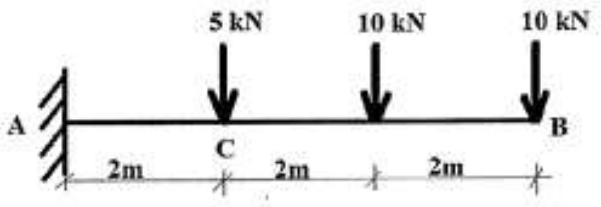
(a) minimum basewidth of the dam for no tension in concrete.

(b) Extreme intensities of pressure on foundation when reservoir is empty.

Take unit weight of concrete and water as 25kN/m3 & 10kN/m3 respectively. (15)

UNIT- III

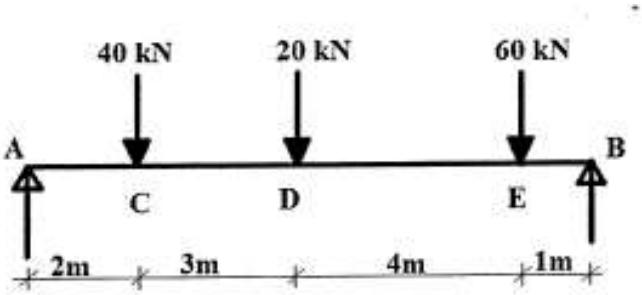
VII Determine the slope and deflection at points B and C of the beam shown. Take $E=2x10^5$ N/mm^2 and $I=2x10^8$ mm^4.



(15)

OR

VIII Find the location and amount of maximum deflection in the beam shown. Take EI=1.39x10^{14} Nmm^2.



(15)

UNIT – IV

IX Draw the BMD & SFD for a continuous beam ABC. AB is of span 6m and carries a point load 3kN at 2m away from A. Span BC is 4m and carries a UDL 1kN/m. The supports are hinged/roller. (15)

OR

X Draw the BMD & SFD for a continuous beam ABC, where AB is of span 6m and BC of span 8m. While end A is fixed, B & C are supported on rollers. The two spans carry UDL 20kN/m throughout the length. (15)

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