Ref. No.: Ex/CON/PC/B/T/311/2024

B. CONS.ENGG. 3RD YR 1ST. SEM. EXAM.-2024

THEORY OF STRUCTURE – II

Time : Three hours **Full Marks : 100**

Answer any **two questions**. All Question carry equal marks.
Assume suitable data not provided, **Mention Part No** on top of the Answer script

PART - I (Marks : 50)

1. Calculate the final bending moment of the **frame** as shown in Fig.1 by **Moment Distribution** Method and draw the **BM diagram**. The moment of inertia of beam BC, I_b = 133333 cm^4 and Column AB & DC, I_c = 67500 cm^4. E = 2.5 X 10^4 MPa.

[C02 + CO3] 25

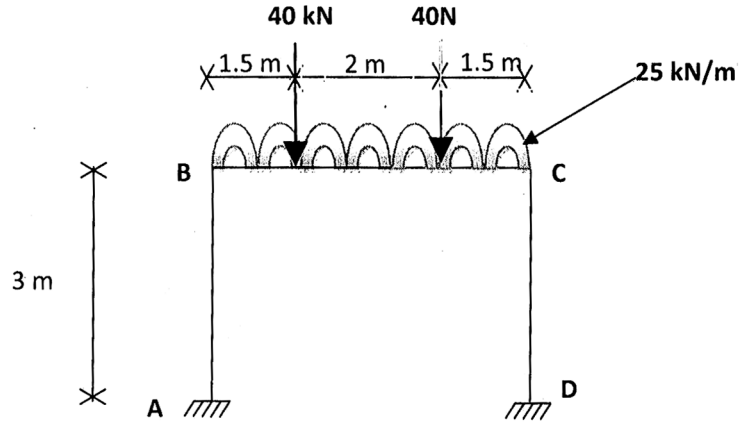

Fig.1: 2D Frame Problem

2. Analyse the **Bontinuous Beam** as shown in Fig.2 by **Slope-Deflection Method** and draw the final bending moment and shear force diagram. E = 2.5 X 10^4 MPa. The depth of beams PQ, QR and RS are 350 mm, 600 mm and 400 mm respectively. The width of all these beams are 200 mm.

[C02 + CO3] 25

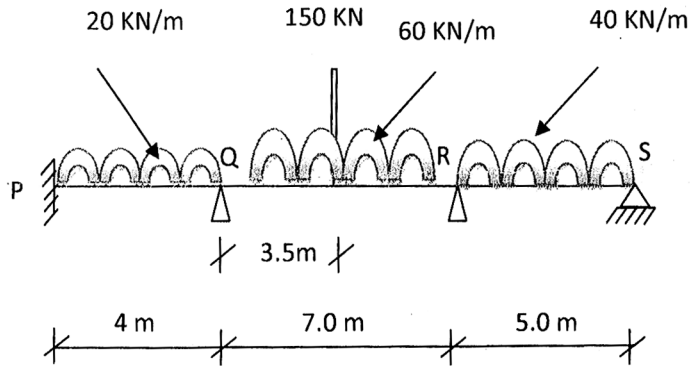

Fig. 2: Continuous Beam

[Turn over

3. a) Derive the **Member Force Expression** of 2D truss element [CO1] 10

b) Evaluate the horizontal and vertical components of deflection of the free end **M** of the **truss** as shown in Fig.3 by **Matrix method of analysis.** [CO4] 15

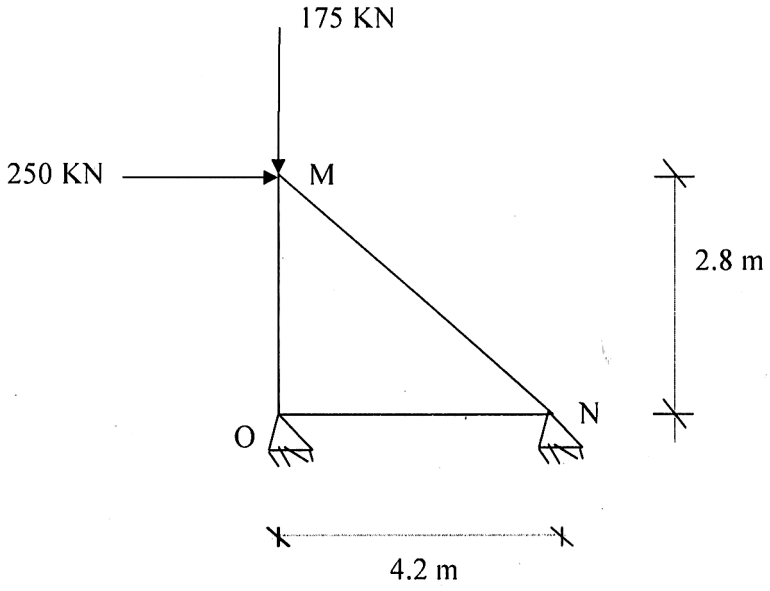

Fig. 3: Truss Problem

All the truss members are made of ISA 100 X 100 X 10 having cross sectional areas of 19.0 cm^2 . The modulus of Elasticity E = 2.0 X 10^5 MPa for all members.

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BE FIRST SEMESTER THIRD YEAR (CONSTRUCTION) EXAMINATION - 2024

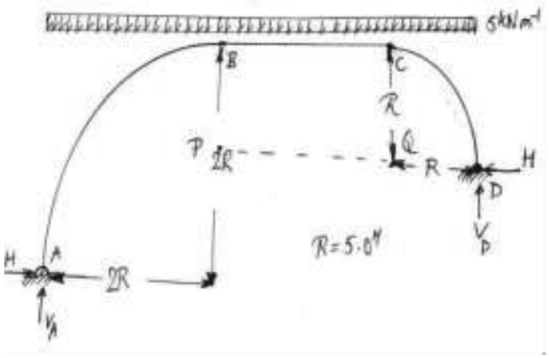
Subject : **THEORY OF STRUCTURES – II**

PART - II (Marks : 50)

Answer parts of any question **SERIALLY**.

Answer ***Question No. 1*** & any ***TWO*** questions. Please start answering a question or part thereof from a **NEW** page. Answers should be brief. Please mark the answers with answer numerical & NOT as 'CO' Nos. which are for Course Curriculum from NAB concepts & students do NOT have any relation & relevance to the same.

Different parts of the same question should be answered together.

1.	1. Determine the horizontal thrust 'H' for the frame at the abutments as shown in the drawing below.  18	CO7 [18]
2.	2. (a) Plot the ordinates of the 'Influence Line Diagram' at 2.0 M intervals for 'Normal Thrust' & 'Shear Force' for a Two Hinged Parabolic Arch of span 12.0 M & crown height 7.0 M (b) Define the concept 'Influence Line Diagram' & 'Muller Breslau Principle'. 10 + 3 + 3 = 16	CO5 [16]
3.	3. Determine from first principles that the 'Reaction Locus' of a two hinged semicircular arch is a straight line parallel to the level of the abutments & spaced ***Π***L / 4, where 'L' is the distance between the abutments. 'Horizontal thrust' (H) has to be determined from first principles. 16	CO9 [16]
4.	4. (a) A load train consisting of 5 point loads 5.0, 8.0, 7.0, 8.0 & 6.0 kN separated by a distance of 3.0, 4.0, 3.5 & 3.0 M from left to right is approaching a bridge girder spanning 50.0 M & supported on two abutments at the same level from left to right. Determine the Maximum Bending Moment encountered. Plot the Shear Force diagram for the girder for the load alignment for maximum bending moment. (b) State & prove 'Maxwell's Reciprocal Theorem' 13 + 3 = 16	CO5, CO6 [16]