

## B. CONS.ENGG. 3RD YR 1ST. SEM. EXAM.-2018

Time : Three hours

THEORY OF STRUCTURE – II, Part – I,

Full Marks : 100

Answer any two questions. Assume suitable data not provided

1. Evaluate the horizontal and vertical components of deflection of the free end R of the bracket truss as shown in Fig.1 by **Matrix Method** of analysis. Calculate also the member forces of PR, SR & QR of the same truss. All the truss members are made of single 150 X 115 X 8 angle having C/S areas of  $20.38 \text{ cm}^2$ . The modulus of Elasticity  $E = 2.1 \times 10^5 \text{ MPa}$  for all the members.

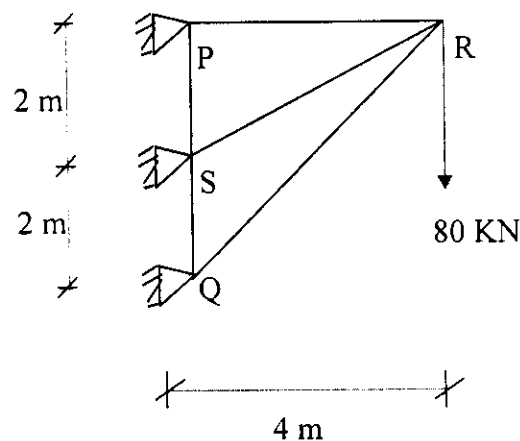


Fig. 1: Truss Problem

2. Calculate the final bending moment of the frame as shown in Fig. 2 by **Moment Distribution Method** and draw the BM diagram. The moment of inertia of beam BC,  $I_b = 133333 \text{ cm}^4$  and Column AB & DC,  $I_c = 67500 \text{ cm}^4$ .  $E = 2.5 \times 10^4 \text{ MPa}$ .

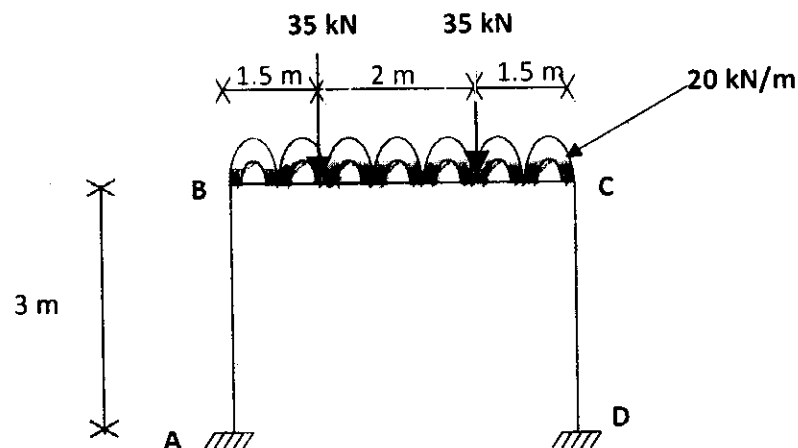


Fig.2: 2D Frame Problem

3. Calculate the final bending moment by **slope-deflection method** and draw the BM diagram of the continuous beam as shown in Fig.3. The intermediate support C settles by 15 mm downward, whereas support R lifts by 15 mm upward. The bending rigidity is constant and equals to  $8.2 \times 10^5$  KN m.

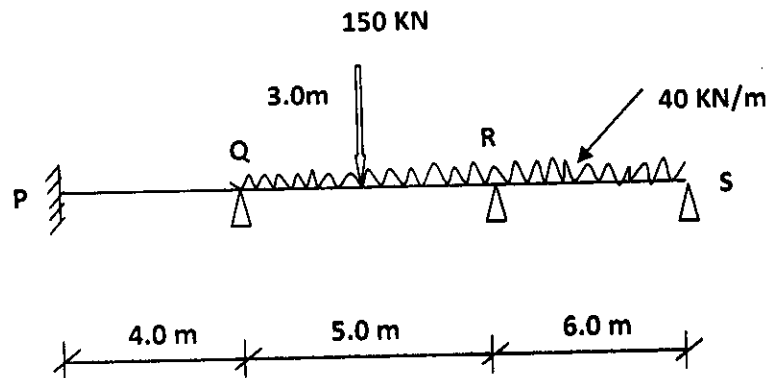


Fig: 3 Continuous Beam

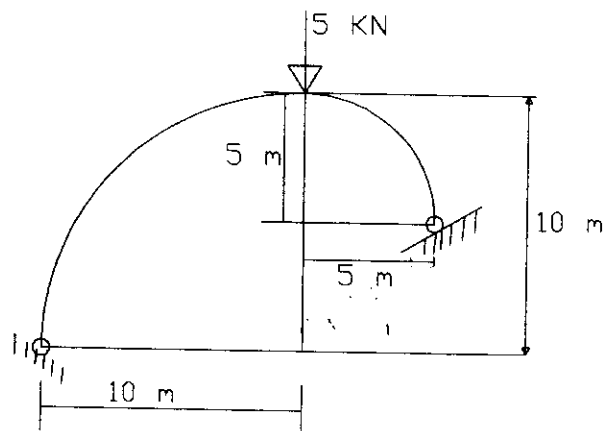
**BE FIRST SEMESTER THIRD YEAR (CONSTRUCTION) - 2018**Answer any **TWO** questions.

EX/CON/T/314/2018

**THEORY OF STRUCTURES - II****PART - II**Answer all parts of the same question **SERIALLY** & written together.This should be **STRICTLY ADHERED** to.Please use a **FRESH** page while answering a **NEW** question or any part of a new question.

1. Determine the horizontal thrust 'H' for the frame at the abutments as shown in the drawing below.

25



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 18.0 M & crown height 6.0 M

(b) Define the concept 'Influence Line Diagram'

22 + 3 = 25

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  $HL/2$ , where 'L' is the distance between the abutments.

25

4. (a) A load train consisting of 4 point loads 6.0, 7.0, 7.0 & 7.0 kN separated by a distance of 3.0, 4.0 & 3.0 M from left to right is approaching a bridge girder spanning 30.0 M & supported on two abutments at the same level from left to right. Determine the Maximum Bending Moment encountered. Plot the Bending Moment in this situation.

(b) State & prove 'Maxwell's Reciprocal Theorem'

18 + 7 = 25