

UNIVERSITY OF RUHUNA

Faculty of Engineering

Mid-Semester 7 Examination in Engineering: June 2014

CE7323: Computer Analysis of Structures

Time: Two Hour

Answer all questions

All Standard Notations denote their regular meanings

Q1. a) Briefly describe the degrees of static indeterminacy of a structure. [1.0 Mark]

b) A frame structure shown in Fig. Q1 is subjected to a moment M_0 at joint B. Using matrix flexibility method (i.e. force method) determine end moments in all the members and the deformation at node B. Use the reaction force at support A as the redundant in the development of force transformation matrix [B] and the member flexibility matrix for a frame element with clockwise moment as,

$$[f] = \frac{L}{6EI} \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}. \quad [9.0 \text{ Marks}]$$

Q2. A plane truss structure is shown in Fig.Q2. Analyse the structure using matrix stiffness method (i.e. displacement method) and determine following parameters.

a) Degrees of freedom at nodes B and C. [5.0 Marks]

b) Reaction forces at supports A and D [2.0 Marks]

b) All the member forces [3.0 Marks]

Take cross section area $A = 125 \text{ cm}^2$ and $E = 200 \text{ GPa}$.

Hint: for a plane truss element, member stiffness matrix can be abstract from the general stiffness matrix for a space frame element. Assume AE is constant for all the members.

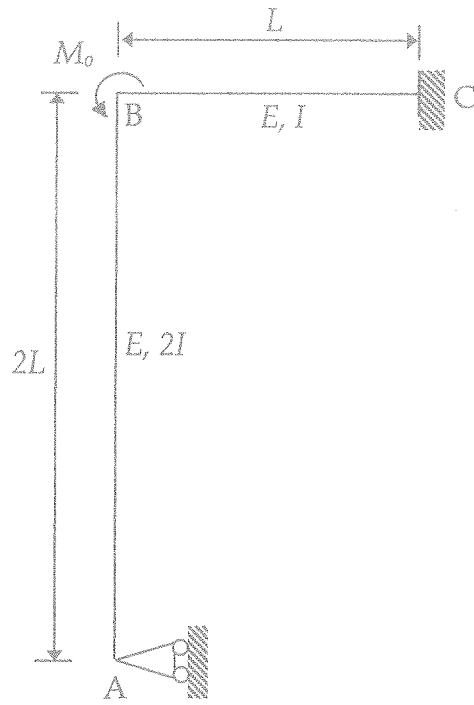


Fig. Q1

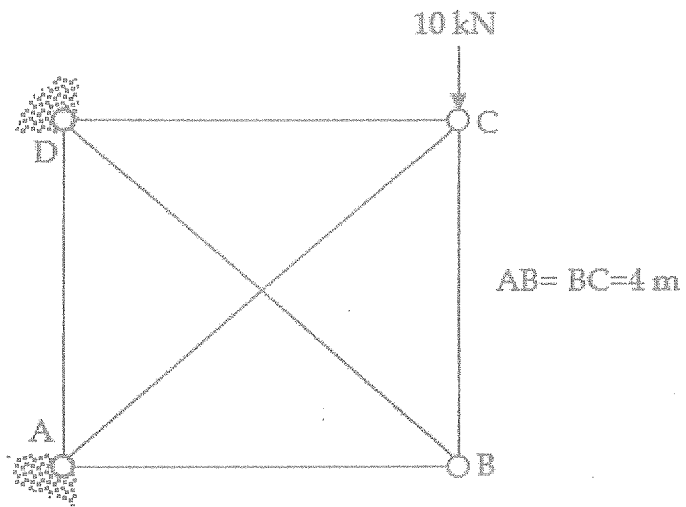


Fig. Q2