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M.Tech. 1st Semester Civil Engg. (Specialisation in
Structural Engg.) Examination, November-2023

ADVANCED STRUCTURAL ANALYSIS

Paper-CE-611/MTSD-102

Time allowed : 3 hours] [Maximum marks : 100

*Note : Attempt any five questions. All questions carry
equal marks.*

1. (a) Derive the expression for transformation
of stiffness matrix from local to Global
co-ordinates.

(b) What is a shear wall. Discuss the structural
behavior of a frame with and without a shear
wall.
2. (a) Determine the global stiffness matrix for the
structure in Fig. 1. Neglect axial deformations in

columns. Assume horizontal displacement of node 1 and node 2 as same and assume equal horizontal displacement at nodes 3, 4 and 5.

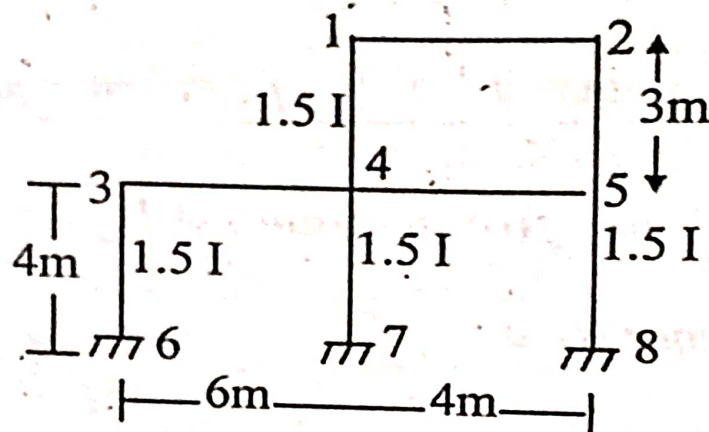


Fig. 1.

- (b) If the member 2 of framed structure shown in Figure. 2. is shorten by 0.01 m. Determine the force in members. Assume $AE = 8 \times 10^6 \text{ N}$.

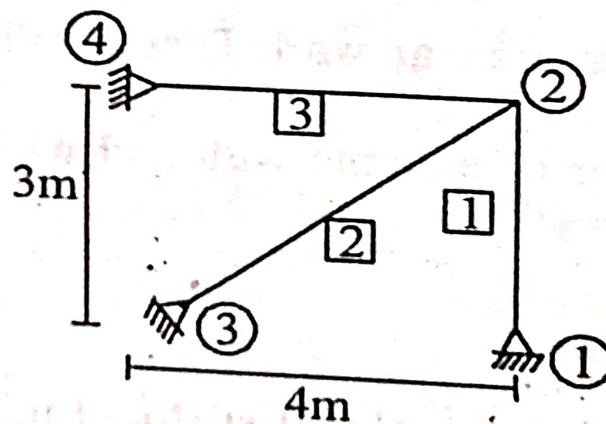


Fig. 2.

3. Analyse the continuous beam given below in Fig. 3. using flexibility method.

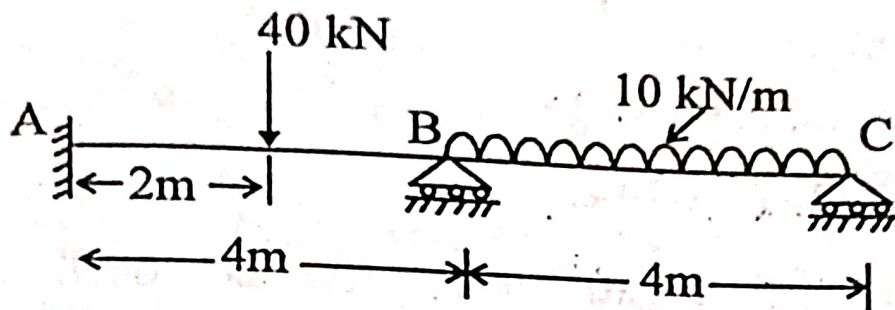


Fig. 3.

4. Analyse the pin jointed truss frame shown in following Fig. 4. by stiffness matrix. Assume cross sectional area of each member 1000 mm^2 , $E = 2 \times 10^5 \text{ N/mm}^2$.

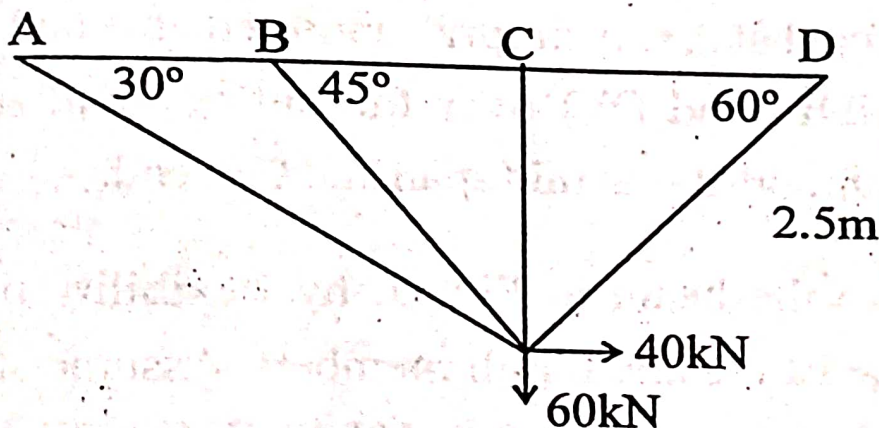


Fig. 4.

5. (a) Derive shape function of one-dimensional linear element (use matrix method).
- (b) What are the different types of element shapes used in finite element methods and explain with neat sketches ?

6. Write short notes on any *three* :
- Local of Global co-ordinates
 - Load vector
 - Semi-band width
 - Sub structuring
7. (a) Derive the stiffness influence coefficients of prismatic cantilever beam AB under UDL load subjected to unit displacement at free end B.
- (b) Write step by step procedure of stiffness matrix in the analysis of continuous prismatic beam ABC fixed at A and simply supported at B and C with UDL load (W) over the entire span. Assume support B is at mid span and C at end.
8. Analyze the beam in Fig. 5. by flexibility method. Assume EI is same for all members. Assume stiffness of spring k at support 2 = 10000 KN/m. $EI = 20000$ KN/m².

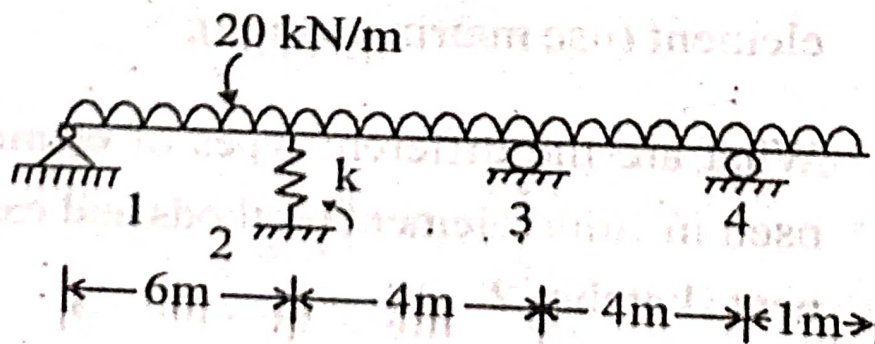


Fig. 5.