

Menofia University.
 Faculty of Engineering
 Civil Engineering Department.
Date: Saturday, 10/6/2017
Total Marks: 100

Subject: Matrix Analysis of Structures
Code: CVE 501
Year: Diploma Level 500
Academic year: 2016-2017
Time Allowed: 3 hours

Allowed Tables and Charts: (None)

Read carefully the given data and solve all questions.

Question 1

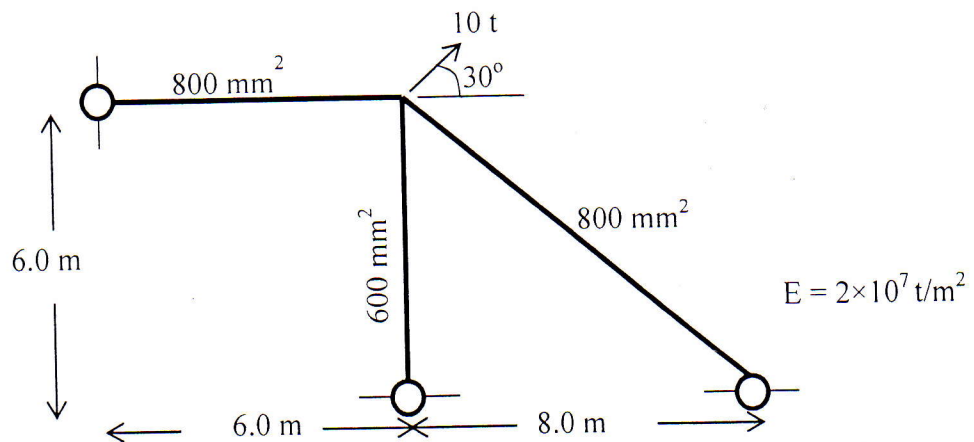
[15 Marks]

- Explain the differences between classical, matrix and finite element methods of structural analysis. [5M]
- Explain the meaning of (Compatibility Conditions) [5M]
- Illustrate the assumptions of linear analysis. [5M]

Question 2

[30 Marks]

For the truss shown in **Figure (1)**, use matrix method to write and solve equations of equilibrium required to find displacements at joints. Then compute reactions at supports and bar forces.



Question 3

[30 Marks]

Determine joint displacements, member end forces and support reactions for the beam shown in **Figure (2)**. Draw BMD, SFD and the deformed shape of the beam.

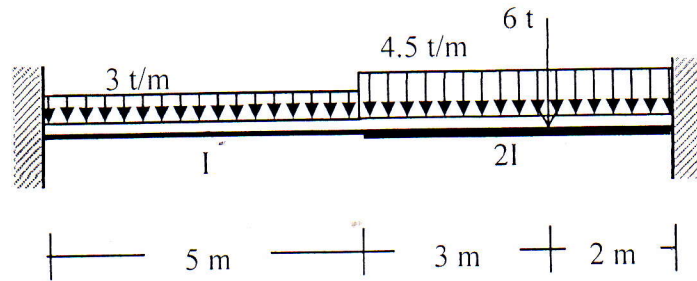


Figure (2)

Question 4

[25 Marks]

The frame shown in Figure (3) is subjected to the given loads. Identify by numbers the degrees of freedom and restrained coordinates.

If the global deformations of the inclined member are:

$$\begin{bmatrix} -7.705 \times 10^{-5} \text{ m} \\ -1.823 \times 10^{-4} \text{ m} \\ 6.299 \times 10^{-5} \text{ rad} \\ 0 \\ 0 \\ 0.00007 \text{ rad} \end{bmatrix}$$

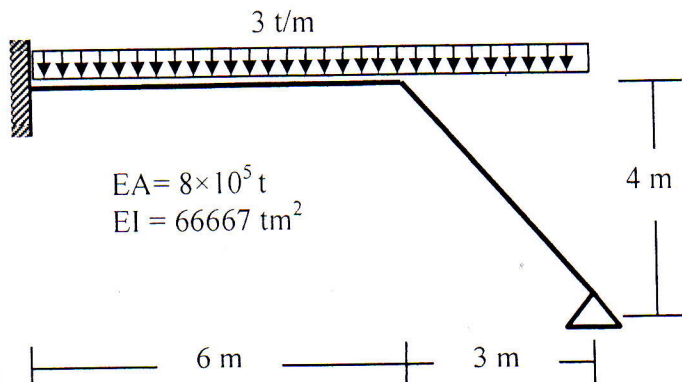


Figure (3)

Calculate end forces of this member in both global and local directions.

$$\frac{wL^2}{12} \left(\begin{array}{c} \text{Diagram of a beam of length } L \text{ with a uniformly distributed load } w. \end{array} \right) \frac{wL^2}{12}$$

$$\frac{Pab^2}{L^2} \left(\begin{array}{c} \text{Diagram of a beam of length } L \text{ with a point load } P \text{ at distance } a \text{ from the left end and } b \text{ from the right end.} \end{array} \right) \frac{Pba^2}{L^2}$$

Our best wishes,

This exam measures the following ILOs

Question number	Q1-a	Q1-b	Q1-c		Q2	Q3			Q4			
	A1	A2	A4		B1	B2			C4			
skills	Knowledge and understanding skills				Intellectual skills				Professional skills			