

COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)
SHIVAJI NAGAR, PUNE - 411 005

END Semester Examination

CE-14001- (CE(DE)-14010) Matrix Analysis of Structures

Course: B.Tech

Branch: Civil Engineering

Semester: Sem VII

Year: 2014-2015

Max.Marks:60

Duration: 3 Hours Time:- 2 pm -5 pm

Date: 28th NOV 2014

Instructions:

MIS No.

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1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of anything like stationery, calculator is not allowed.
5. Assume suitable data if necessary.
6. Write your MIS Number on Question Paper

- (Q1) Determine the forces in all the members of the plane truss shown in figure, if the vertical member is too short by 4 mm and the other members are too long by 3 mm. Take cross-sectional area = 6400 mm² and E = 200 GPa for all members. [12]

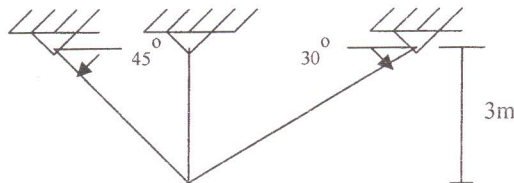


Figure: Problem 1

- (Q2) For the beam shown in figure obtain the reactions at all the supports if the middle support sinks by 2 mm. EI is constant. E= 200 GPa, I = 30390.8 cm⁴. [12]

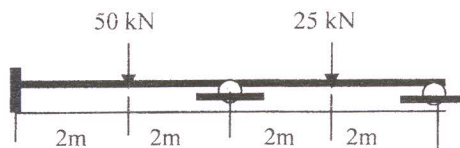


Figure: Problem 2

(Q3) 1. Derive the expression $S_{MS} = R_T^{-1} S_M R_T$ [06]

Where,

S_{MS} = stiffness matrix for structure axes

S_M = stiffness matrix for local axes

R_T = Rotation Transformation matrix

2. Write a MATLAB function for obtaining the member stiffness matrix for a rigid jointed plane frame member. [06]

(Q4) For the grid shown find the unknown joint displacements and the member forces. [12]
 $EI = 73000 \text{ kN m}^2$ and $GJ = 58000 \text{ kN m}^2$ for all members.

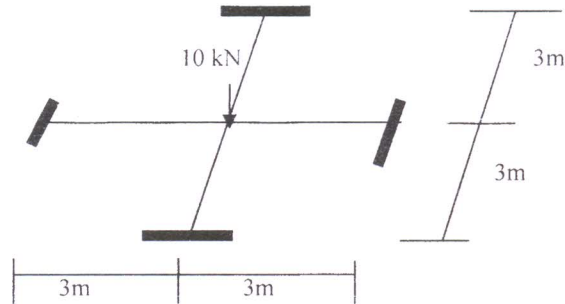


Figure: Problem 4

(Q5) 1. Obtain the shape functions for a two node bar member. [06]

2. For a space truss member obtain the member stiffness matrix with reference to global axes. [06]