

Code No: RT41033

R13
Set No. 1

IV B.Tech I Semester Supplementary Examinations, February/March - 2018

FINITE ELEMENT METHODS

(Common to Aeronautical Engineering, Automobile Engineering and Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) Explain about plane stress and plane strain. [3]
- b) Discuss about the elements used in discretization. (1D,2D,3D case). [3]
- c) Write the Hermite shape functions of beam element and plot them. [4]
- d) Write the advantages and applications of axisymmetric element. [4]
- e) Explain about isoparametric and subparametric elements. [4]
- f) Discuss about the softwares used to evaluate the problems in FEM [4]

PART-B (3x16 = 48 Marks)

2. a) Discuss about different weighted residual methods with the help of an example. [8]
- b) For the spring assemblages shown in figure 2 (b), determine the nodal displacements by using the concept of potential energy.

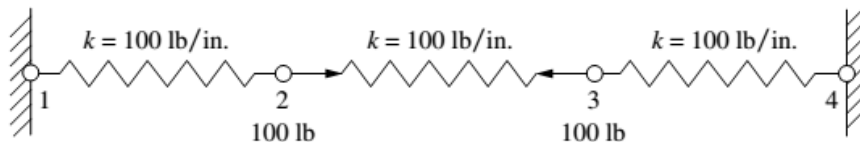
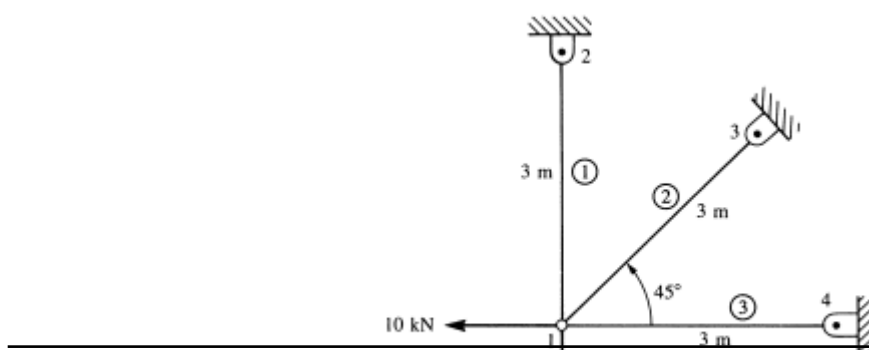


Figure 2 (b)

3. a) Consider a simple one dimension structure with three elements, explain the process of stiffness matrix and load vector assembly. [8]
- b) Discuss about the types of elements used in domain discretization. [4]
- c) Write the properties of stiffness matrix. [4]
4. For the plane trusses shown in figure 4, determine the horizontal and vertical displacements of node 1 and the stresses in each element. All elements have $E=210 \text{ GPa}$ and $A=4.0 \times 10^{-4} \text{ m}^2$.

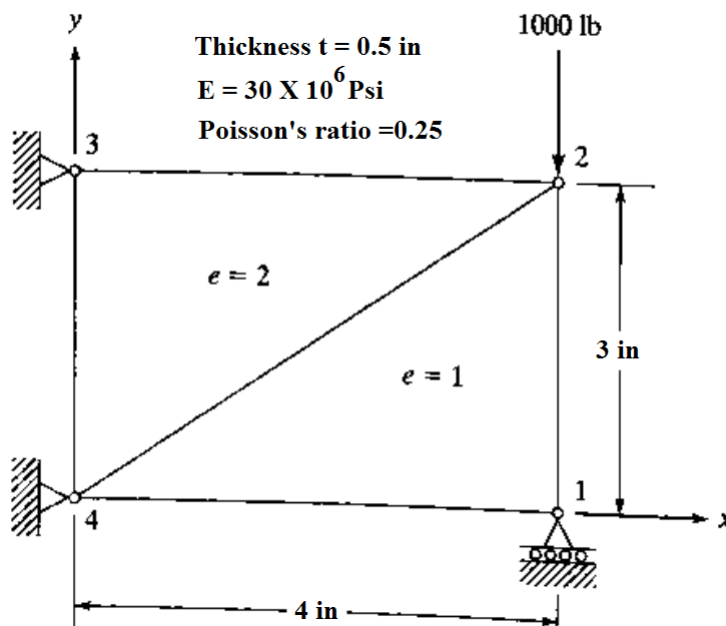


Code No: RT41033

R13

Set No. 1

5. For the two dimensional loaded plate shown in figure 5, determine the displacements of node 1 and 2 and the element stresses using plane stress conditions.



[16]

6. a) Derive the strain displacement matrix of two dimensional four noded isoparametric elements.
 b) Evaluate the integral by two and three point gauss quadrature rule.

[10]

$$I = \int_{-1}^1 x^3 - 2x^2 + 5x - 7 \, dx$$

[6]

7. a) For the composite wall shown in figure 7 (a), determine the interface temperatures considering three elements.

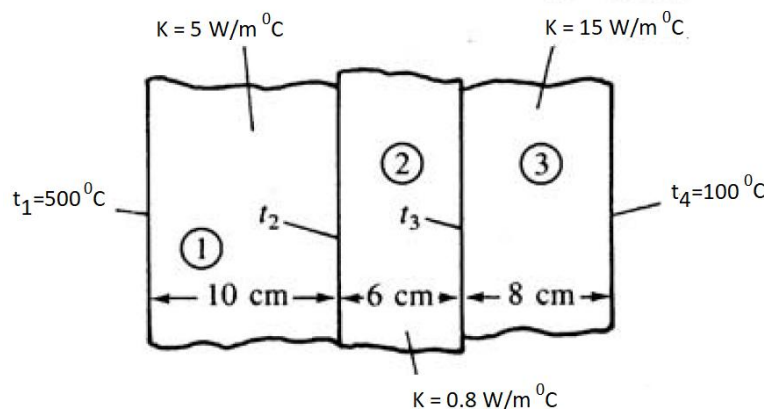


Figure 7 (a)

[12]

- b) Derive the consistence mass matrix of a two node bar element.

[4]