(3 Hours) **Max. Marks: 80**

(1) Question 1 is compulsory.
(2) Attempt any **three** from the remaining questions.
(3) Assume data if required.
(4) Figures to the right indicate full marks.

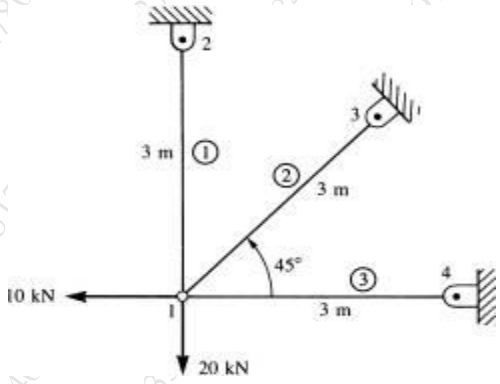
Solve any four

1. a) Explain about plane stress and plane strain. [5]
   b) Discuss about the elements used in discretization. (1D,2D,3D case). [5]
   c) Write the advantages and applications of axisymmetric element. [5]
   d) Explain about isoparametric and subparametric elements. [5]
   e) Discuss about the softwares used to evaluate the problems in FEM [5]

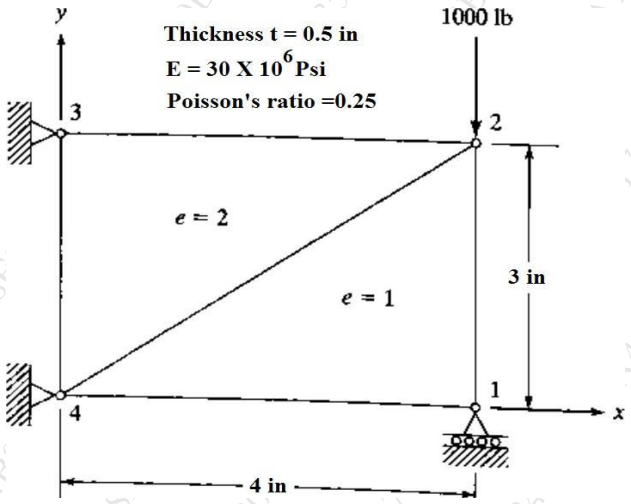
2. a) Discuss about different weighted residual methods with the help of an example. [8]
   b) Sources of Error in FEA. [4]
   c) Derive the strain displacement matrix of a constant strain triangle element. [8]

3. a) Consider a simple one dimension structure with three elements, explain the process of stiffness matrix and load vector assembly. [10]
   b) Discuss about the types of elements used in domain discritization. [5]
   c) Discuss the consistent mass matrix and lumped mass matrix. [5]

4. a) Derive the strain displacement relation for a 2 dimensional element? [6]
   b) For the plane trusses shown in figure , determine the horizontal and vertical displacements of node 1 and the stresses in each element. All elements have E=210 GPa and A=4.0 X 10^{-4} m^2. [14]



5. a) For the two dimensional loaded plate shown in figure , determine the displacements of node 1 and 2 and the element stresses using plane stress conditions. [16]



b) Differentiate between local and global coordinates? [4]

6. a) Derive the strain displacement matrix of two dimensional four noded isoparametric elements. [10]

b) Evaluate the integral by two and three point gauss quadrature rule. [6]

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

c) Derive the consistence mass matrix of a two node bar element. [4]
