7E4060

7E4060

B. Tech. VII Semester (Main) Examination 2015

MECHANICAL ENGINEERING # 7ME01 # MODEL PAPER

FINITE ELEMENT METHODS

Time : 3 Hours | Min. Passing Marks : 24 | Maximum Marks : 80

Instruction to Candidates :

*Attempt any **five** questions, selecting **one** question from **each** unit. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit–'I'

1. (*a*) Write a brief explanation of FEA for a stress analysis problem. [8]
   (*b*) Is there any connection between the FEM and the boundary element method (BEM)? [8]

OR

1. (*a*) Why should one use finite elements? [8]
   (*b*) What is the finite element method (FEM)? [8]

Unit–'II'

2. (*a*) Explain Strain and Linear constitutive equations for the element of previous question. [4]
   (*b*) Explain the terms 'Plane stress' and 'Plane strain' problems. [8]
   (*c*) Explain stresses in typical element. [4]

OR

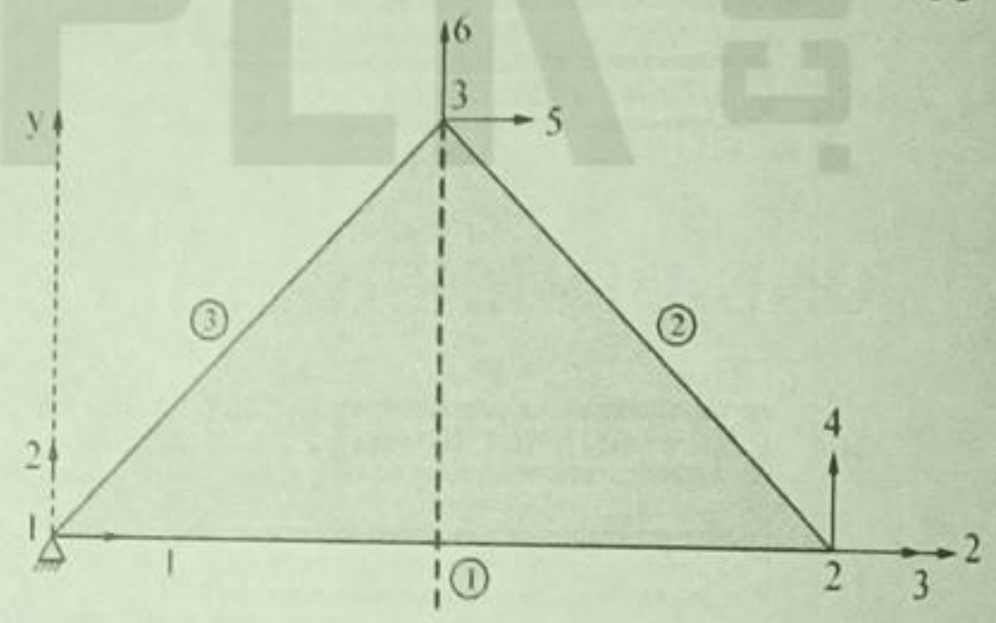
2. (*a*) Explain principle of minimum potential energy. [8]
   (*b*) The thin plate of uniform thickness 20 mm, is as shown in Fig. In addition to the self weight, the plate is subjected to a point load of 400N at mid-depth. The Young's modulus E = $2\times10^5 N/mm^2$ and unit weight $\rho = 0.8\times10^{-4}$ N/mm^2. Analyse the plate after modeling it with two elements and find the stresses in each element. Determine the support reactions also. [8]

Unit–'III'

3. (*a*) Elaborate two dimensional trusses with FEA. [8]
   (*b*) For the three–bar truss shown in Fig. determine the nodal displacements and the stress in each member. Find the support reactions also. Take modulus of elasticity as 200 GPa. [8]

OR

3. (*a*) Derive the expression for consistent load vector due to self weight in a CST element. [8]
   (*b*) If the support B of truss shown in Fig. yields by 0.1 mm, determine the member forces due to applied load and yielding of the support. [8]



Unit–'IV'

4. (*a*) Explain Rayleigh Ritz Method. [8]
   (*b*) Applied Galerkin's Method To Elasticity Problems. [8]

OR

4. (*a*) Explain Galerkin's Method. [6]
   (*b*) Using Rayleigh–Ritz method determine the expressions for deflection and bending moments in a simply supported beam subjected to uniformly distributed load over entire span. Find the deflection and moment at midspan and compare with exact solutions. [10]

Unit–'V'

5. (*a*) Explain six node triangular element. [8]
   (*b*) Explain rectangular element. [8]

OR

5. (*a*) Explain Higher order one-dimensional element. [8]
   (*b*) Explain One-dimensional Element in polynomial form. [8]