PVP 12

Code: ME7T4

IV B.Tech - I Semester – Regular Examinations – November 2015

FINITE ELEMENT METHODS
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Answer any FIVE questions. All questions carry equal marks

1. a) If a displacement field is described by

$u=1+3x+4x^3+6xy^2$

$v=xy-7x^2$

determine ε_x, ε_y *and* γ_{xy} at point (1, 2). 6 M

b) Determine the displacement of nodes of the spring system as shown in Figure-1. 8 M

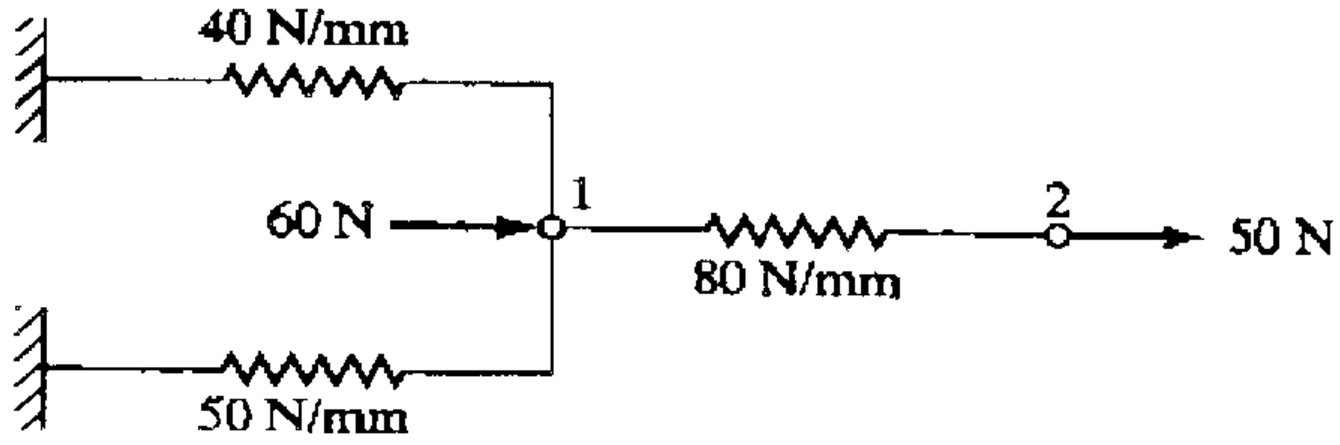
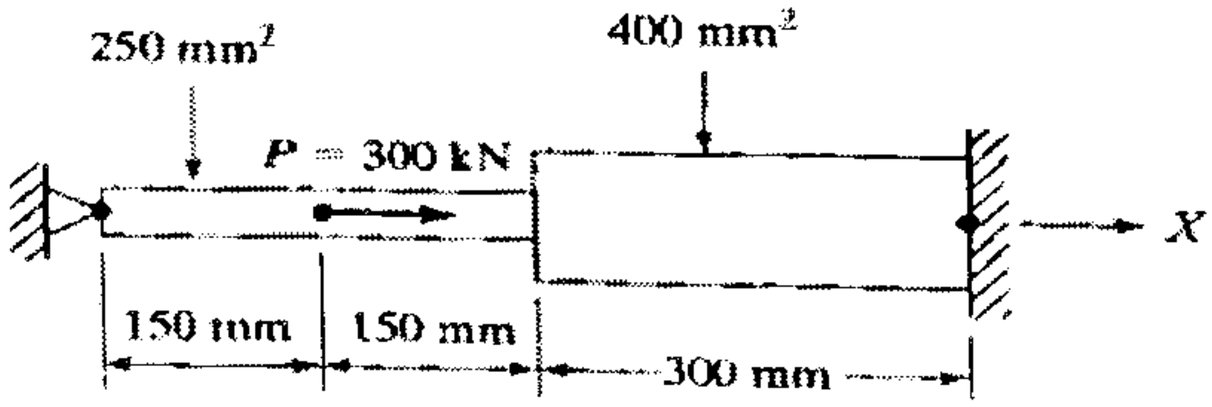


Figure-1

2. Determine the nodal displacements, element stresses, and support reactions by adopting the elimination method for handling boundary conditions. For the Figure-2 as shown below. 14 M



$E = 200 \times 10^9$ N/m²
(1 kN = 1000 N)

Figure-2

3. Formulate one dimensional heat transfer problem using Galerkin approach. 14 M

4. Determine the vector $\mathbf{q}'$, stress in the element and stiffness matrix, if q=[1.5, 1.0, 2.1, 4.3]. 14 M

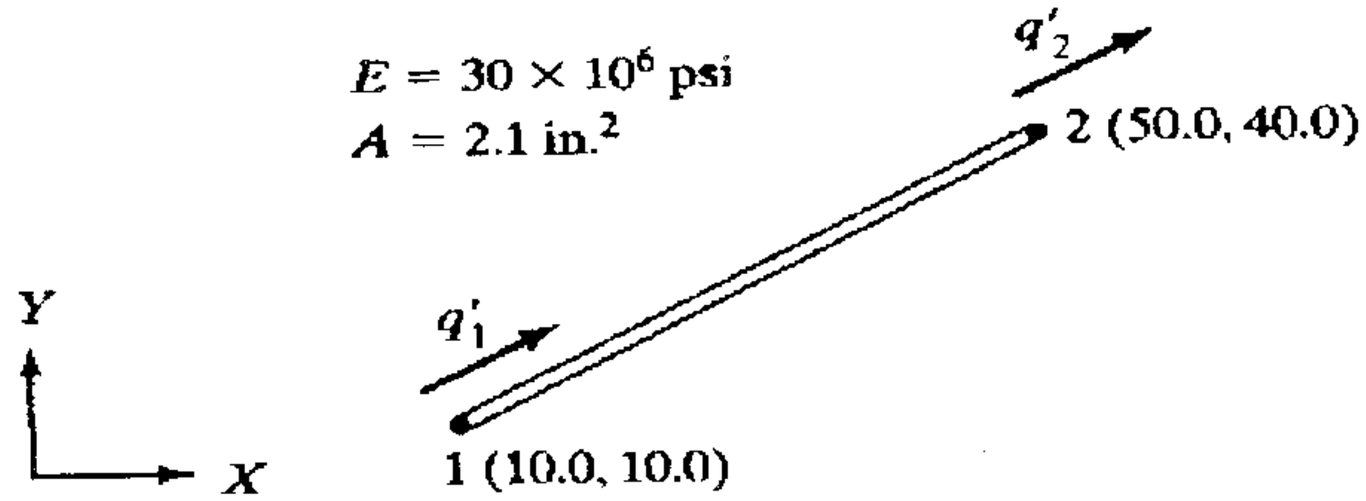


Figure-3

5. A concentrated load P=50kN is applied at the center of a fixed beam of length 3m, depth=200mm and width 120 mm. Calculate the deflection and slope at the mid point. Assume E=2X10^5 N/mm^2. 14 M

6. The nodal coordinates of the triangular element as shown in Figure-4. At the interior point 'P' the x cordinate is 3.3 and N_1=0.3. Determine the value of N_2, N_3 and y value. 14 M

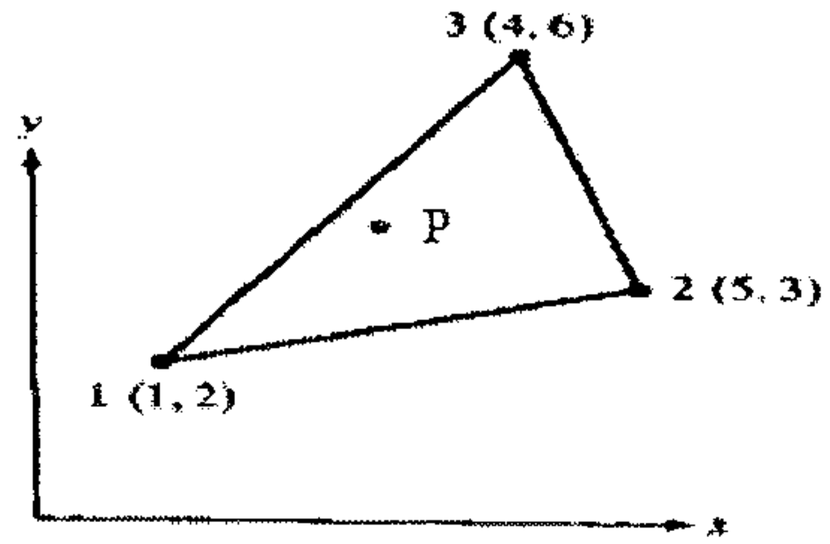


Figure-4

7. a) Derive the shape functions for 4 -noded quadrilateral element. 7 M

b) Explain Numerical integration. 7 M

8. Develop stiffness matrix and mass matrix of a bar subjected to axial vibrations as shown in Figure-5. Determine natural frequencies. Take density=7500 kg/m^3, E=200 GPa. 14 M

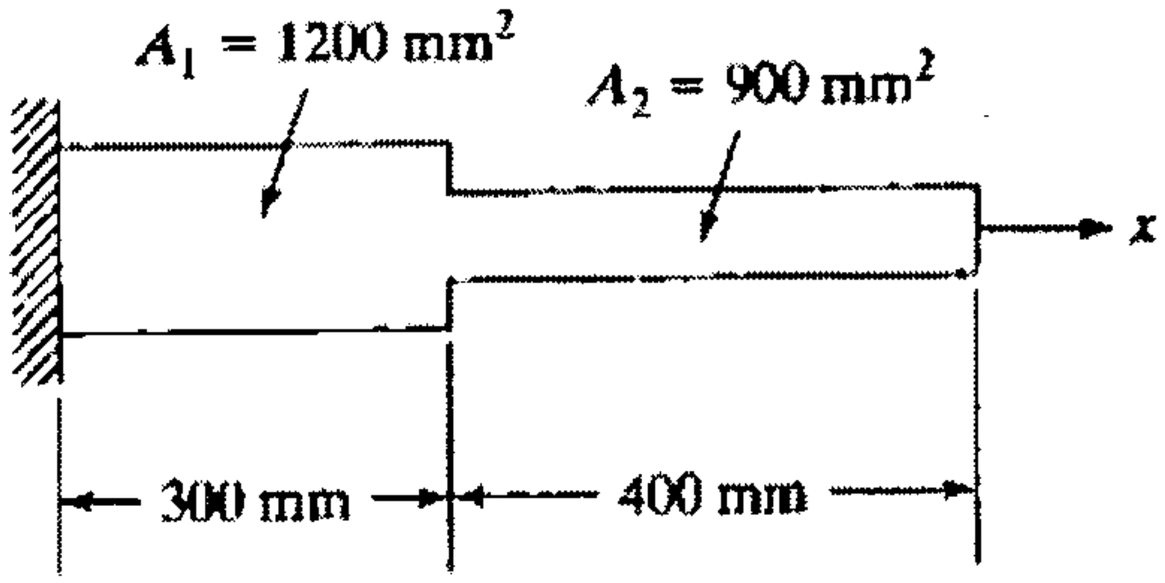


Figure-5