PVP 12

Code: **MEMD1T4**

I M.Tech - I Semester - Regular Examinations – February-2016

FINITE ELEMENT METHODS
(MACHINE DESIGN)

Duration: 3 hours Max. Marks: 70

Answer any FIVE questions. All questions carry equal marks

1. Explain potential energy method and Rayleigh-Ritz method with an example. 14 M

2. Consider the bar in Figure-1. Determine the nodal displacements, element stresses. 14 M

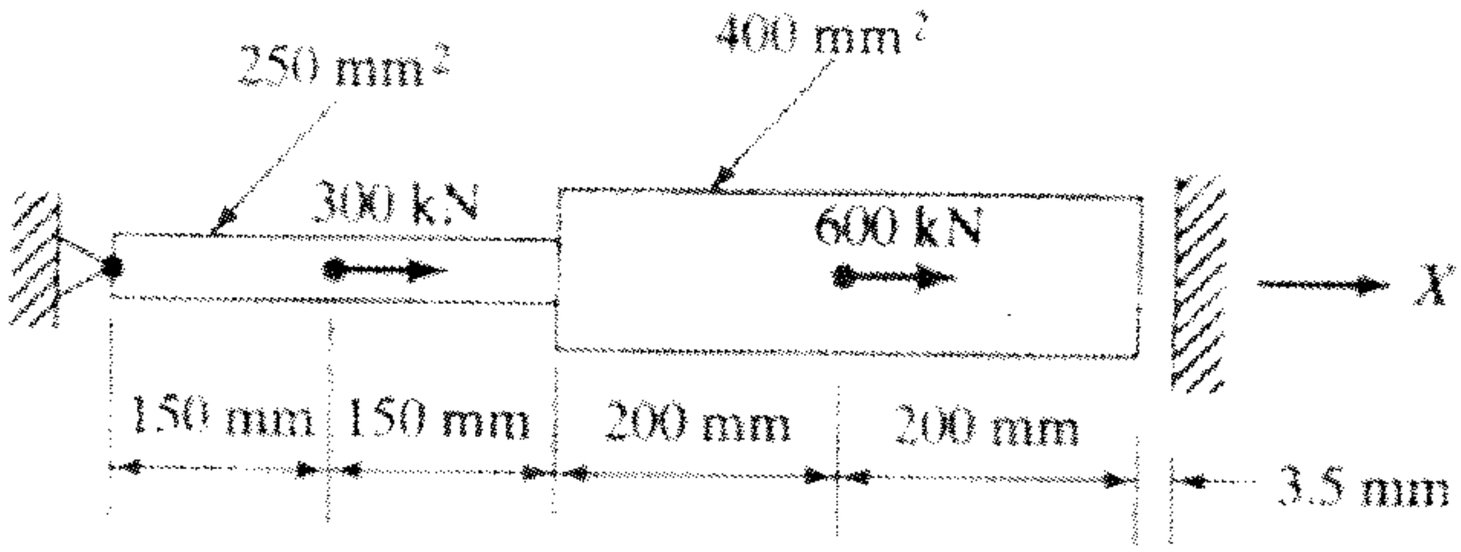


Figure-1

3. Write short notes on 14 M
   i) Requirements for convergence and
   ii) Pascal's triangle.

4. For the plane truss shown in Figure-2, determine the horizontal and vertical displacements of the nodes and stress in each element. All elements have E=200 GPa and A=250 mm^2 . 14 M

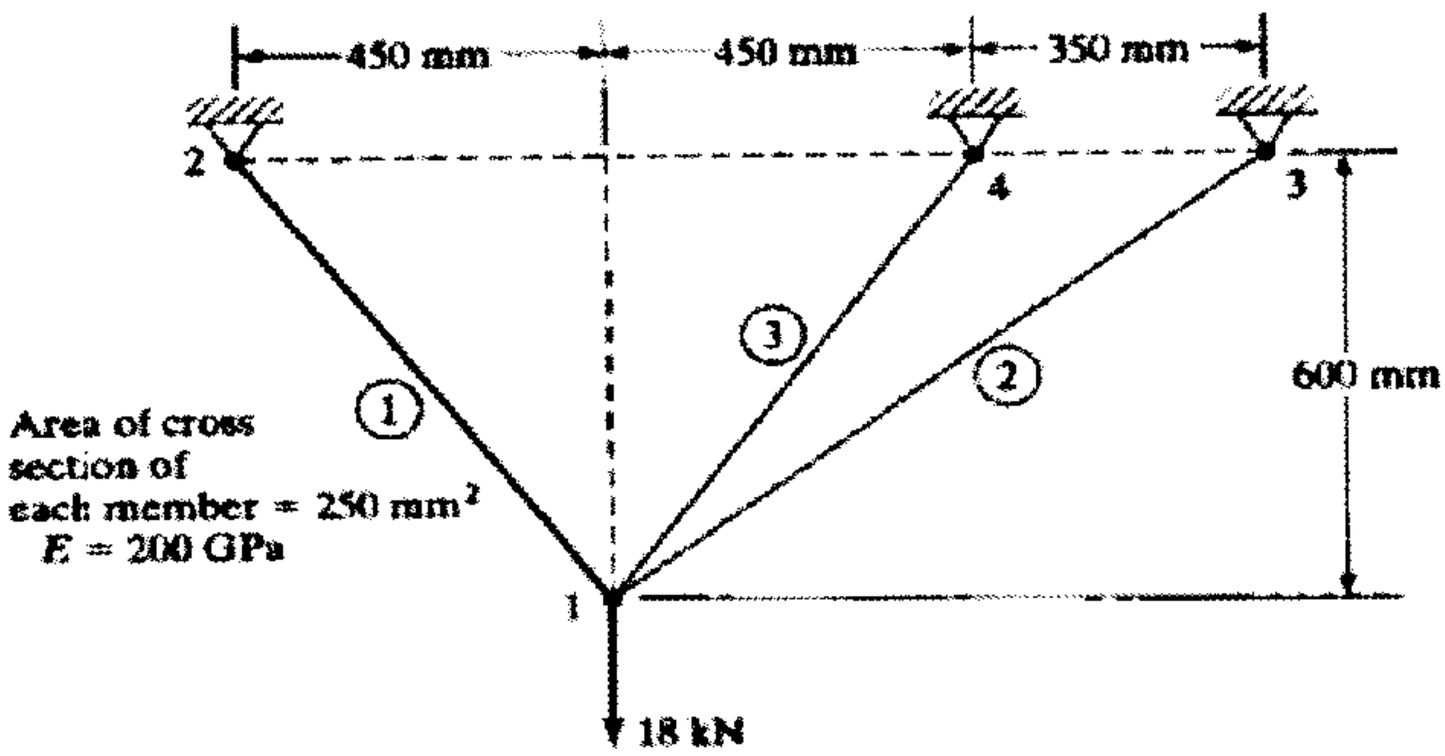
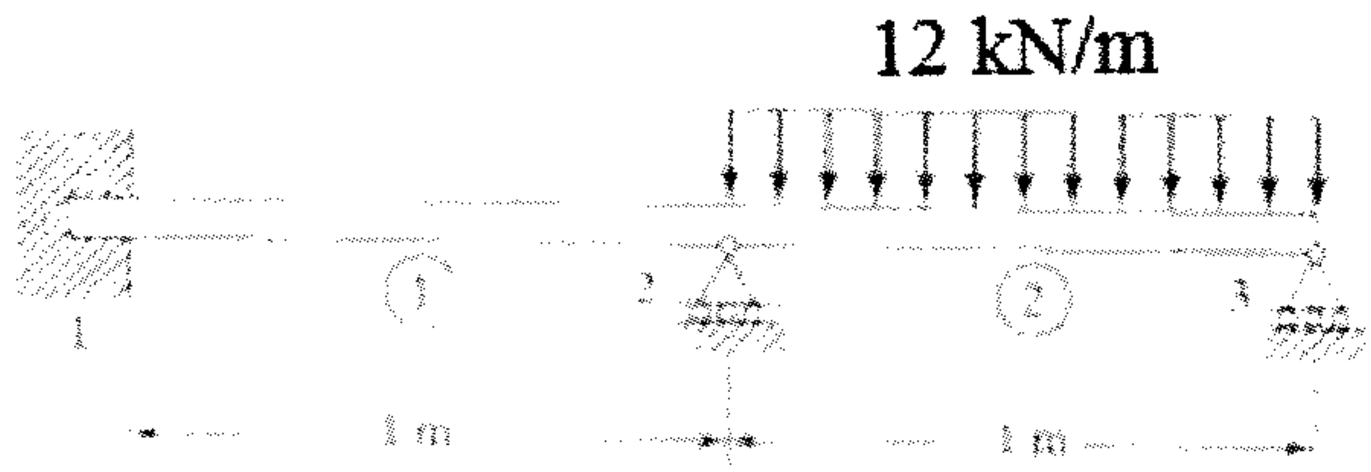


Figure-2

5. For the beam and loading shown in Figure-3, determine
   i) the slopes at 2 and 3 and
   ii) the vertical deflection at the midpoint of the distributed load.



E=200 GPa $I = 4 \times 10^8 mm^4$

Figure-3

14 M

6. For the two dimensional plate shown in Figure-4. Determine the deflection at the point of load application using one element model. Assume plane stress condition. 14 M

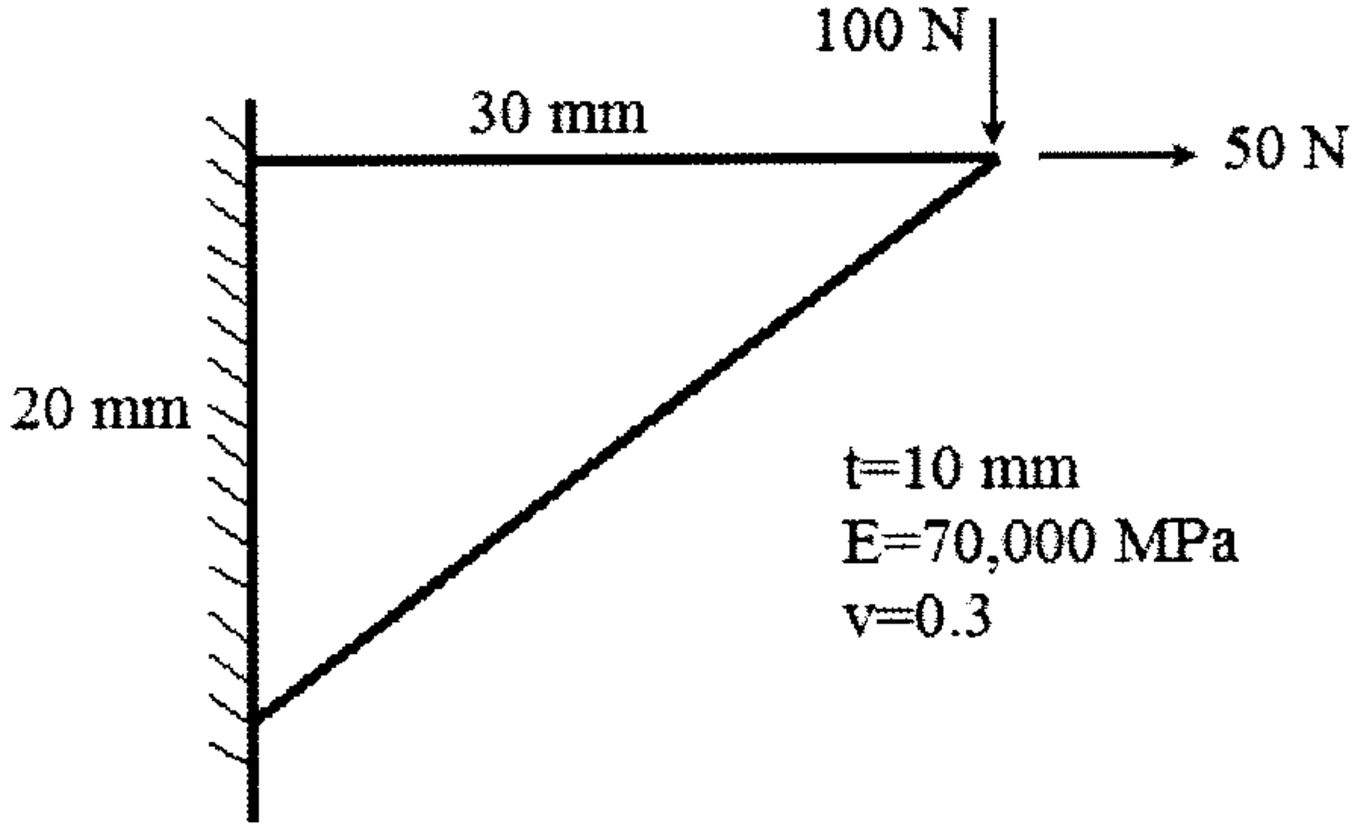


Figure -4

7. Evaluate the lowest eigenvalue and the corresponding eigenmode for the beam shown in Figure-5. 14 M

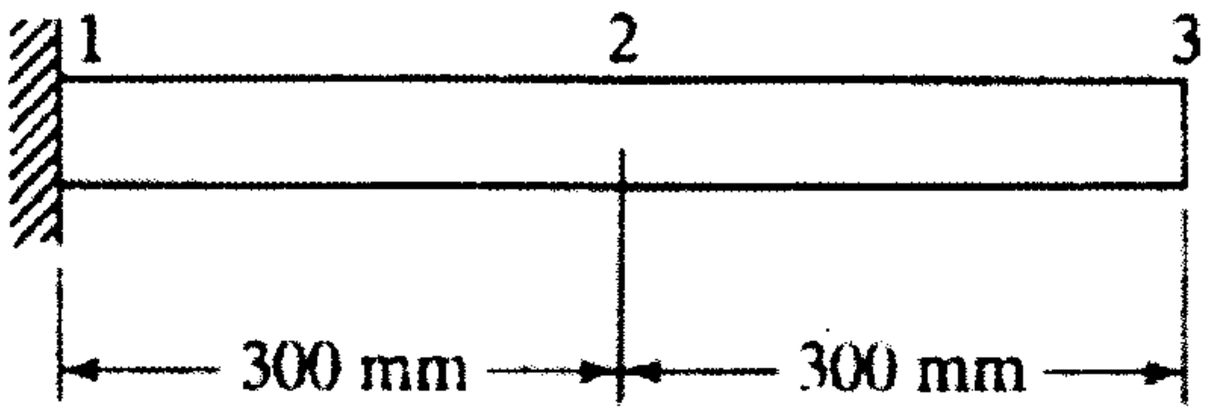


Figure-5

8. Figure-6 shows a four node quadrilateral. The (x,y) coordinates of each node are given in the figure. The element displacement vector q is given as

$q = [0,0,0.2,0,0.15,0.1,0,0.05]^T$ 14 M

Find the following:

a) the x-,y- coordinates of a point P whose location in the master element is given by ξ=0.5 and η=0.5 and

b) the u, v displacements of the point P.

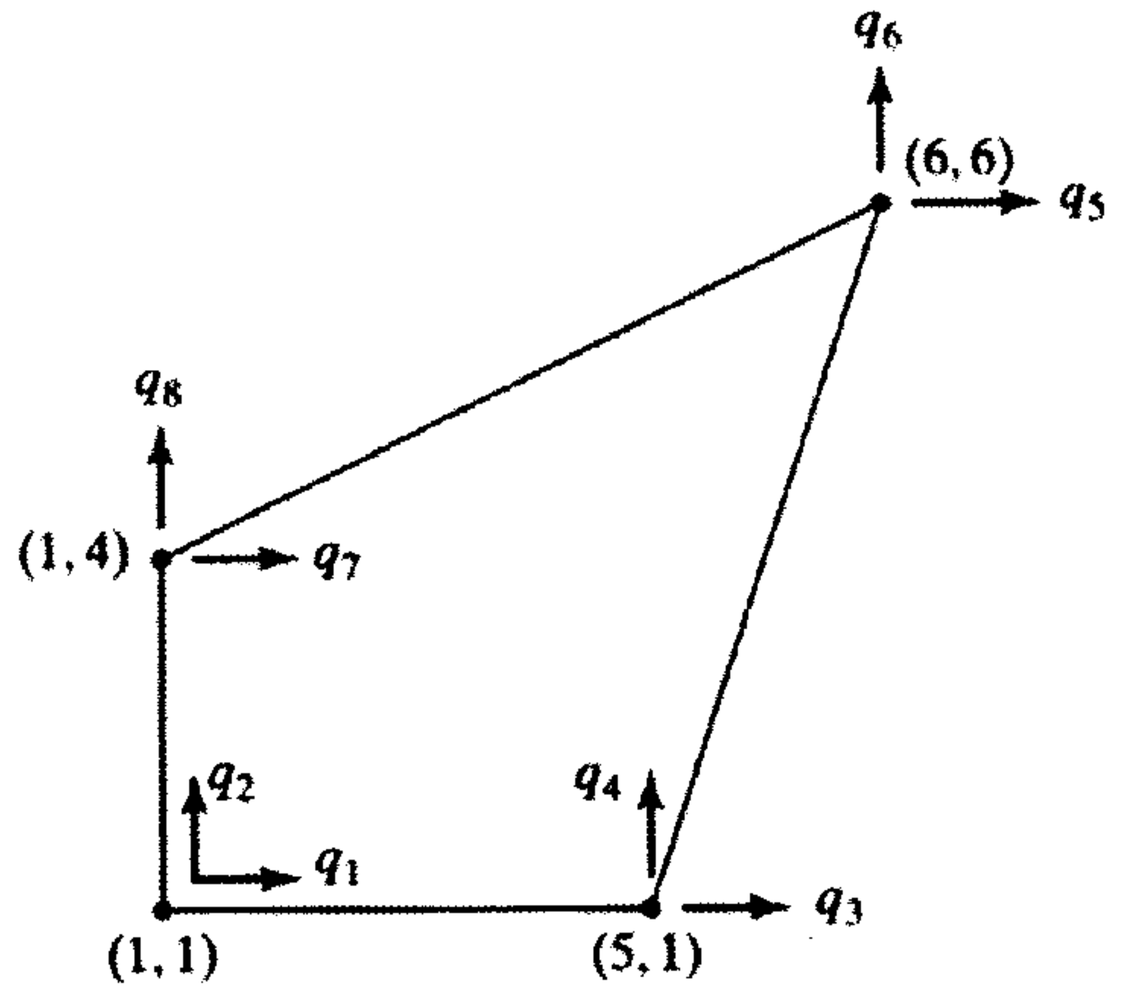


Figure-6