Code No: 56017

R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, May - 2016

FINITE ELEMENT METHODS

(Common to ME, AE, MSNT)

Time: 3 hours **Max. Marks: 75**

Answer any five questions

All questions carry equal marks

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1.a) Using Rayleigh Ritz method, determine the deflection at the center of a simply supported beam.

b) State few applications of FEM. [7+8]

2. A thin steel plate having two elements is subjected to a load, $P = 500\ N$ at node-2 as shown in figure 1 the thickness of the plate is 10 mm. $E = 200$ GPa and weight density = 7850 kg/m^3. Determine nodal displacements and element stresses using penalty approach. [15]

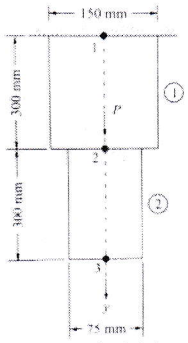

Figure 1

3. Determine the forces in the members of the truss shown in figure 2. Take $E = 200$GPa, A = 2000 mm^2. [15]

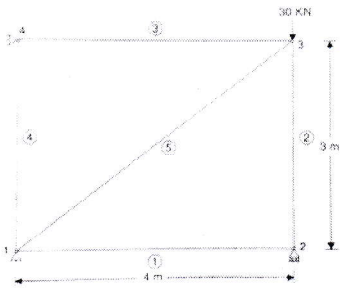

Figure 2

4. A beam of length 10 m, fixed at one end supported by a roller at the other end carries a 20 kN concentrated load at the centre of the spam. By taking the modules of elasticity of material as 200 GPa and moment of inertia as 24×10^{-6} m^4 (figure 3), determine:

a) Deflection under load

b) Shear force and bending moment at mid span.

c) Reactions at supports [5+5+5]

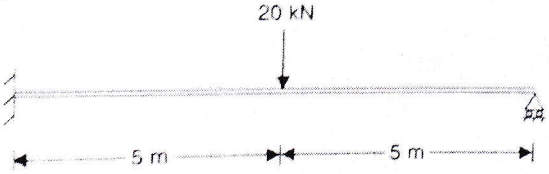

Figure 3

5. Find the consistent loads in x and y directions at the nodes 1- 6- 3 of the LST shown in figure 4. A uniform load of intensity w / unit length is acting normal to the edge containing the nodes 1- 6- 3, Assume unit thickness for the element. [15]

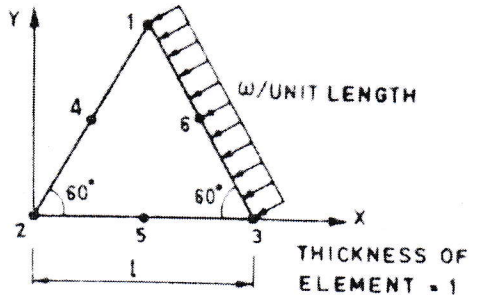

Figure 4

6. A solid element in the form of a right circular cone is under the action of self weight along its axis. It is proposed to be analysed by using single axi-symmetric ring element of triangular cross section (figure 5). Determine the shape functions for the element. [15]

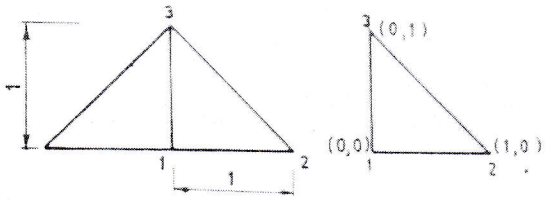

Figure 5

7. Evaluate the stiffness matrix and heat rate vector for the element shown in figure 6. Take h = 0.2 W/cm^2 ^{0}C and T_∞ = 10^{0}C and k = 2 W/cm^{0}C. [15]

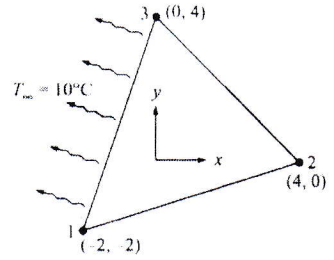

Figure 6

8. Evaluate eigenvalues and eigenvectors of the beam shown in figure 7. Use two element model. Take E = 200 GPa. Weight density 7850 kg/m^3. [15]

Figure 7

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