PVP 17

Code: 17MEMD2T3

I M.Tech - II Semester – Regular Examinations – AUGUST 2018

FINITE ELEMENT METHODS IN ENGINEERING
(MACHINE DESIGN)

Duration: 3 hours Max. Marks: 60

Answer the following questions.

1. a) What is Rayleigh-Ritz method? Explain. 7 M

   b) Explicate weighted residual method with the help of an example. 8 M

(OR)

2. a) Discuss the basic steps involved in finite element method. 7 M

   b) With the help of neat sketches, discuss the node numbering scheme in FEM. 8 M

3. Compute the nodal displacements, stresses and reaction at the support in the stepped bar subjected to an axial loads of P1=3000N and P2= 2000N as shown in Figure1. The modulus of elasticity of the material of the bar is 2.1×10^5 MPa. 15 M

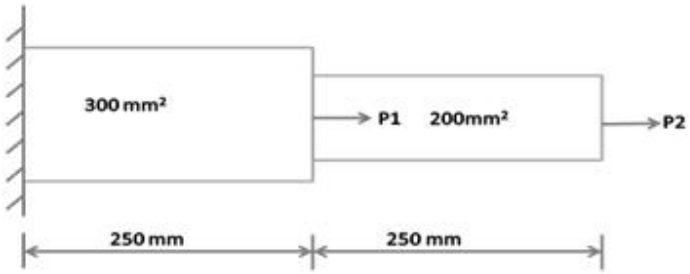

Figure1

(OR)

4. a) Estimate the stiffness matrix and the deflection at the centre of the simply supported beam of length 3m. A 50 kN of load is acting at the center of the beam. Take flexural rigidity EI = 800 x 10^3 N-m^2. 10 M

   b) Derive element stiffness matrix of plane truss element. 5 M

5. a) The nodal coordinates of a triangular element are 1(1,3), 2(5,3) and 3(4,6). At a point P inside the element, the x-coordinates is 3.3 and the shape function N_1 = 0.3. Determine the other shape functions and y-coordinates of the point P. 5 M

   b) An axisymmetric ring element is shown in Figure2 . Derive the matrices, [B] and [D].
   Take E = 2 X 10^5 N / mm^2 and μ = 0.33. 10 M

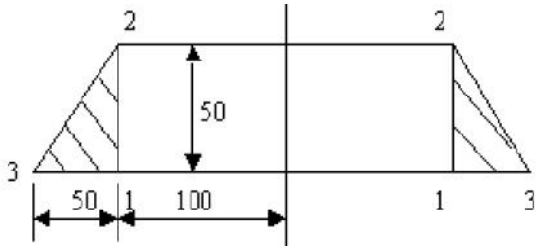

Figure2

(OR)

6. a) Derive the stiffness matrix for a two dimensional four nodded isoparametric quadrilateral element. 7 M

b) Evaluate the integral $\int (2+ x+ x^2) dx$ by one point and two point Gaussian quadrature between the limits -1 and +1 and compare with exact value. 8 M

7. Compute the Eigen values and Eigen vectors for the stepped bar shown in Figure3.

A_1= 1200 mm^2, A_2= 900 mm^2, E= 200 GPa, L_1=400mm, L_2=300mm and mass density= 7840 kg /mm^3. 15 M

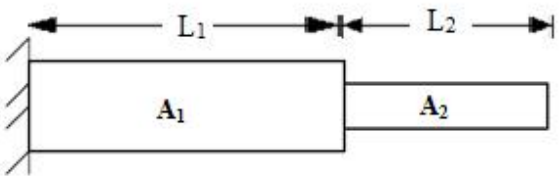

Figure3

(OR)

8. a) Discuss the various convergence requirements used in finite element analysis. 6 M

b) Compare h-refinement and p- refinement methods. 4 M

c) What is Pascal's triangle? How it is useful in selecting the polynomials for representing element field variables. 5 M