R09

Code No: C0402

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech I - Semester Examinations, March/April-2011

FINITE ELEMENT ANALYSIS

(CAD/CAM)

Time: 3hours **Max. Marks: 60**

Answer any five questions

All questions carry equal marks

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1. a. List the advantages and disadvantages of FEM over other traditional variational methods. (5)
   b. Derive the finite element equation using the potential energy approach. (7)

2. a. Illustrate the Rayleigh-Ritz method in detail by applying it on an axially loaded bar at one end and fixed at one end as shown on fig.1. (6)

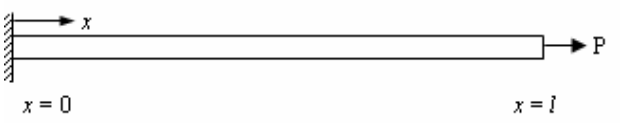

Fig. 1

   b. Explain about the Lagrangian constraints used in the principles of elasticity with one example. (6)

3. For the three stepped bar shown in fig. 2, the fits snugly between the rigid walls at room temperature. The temperature is then raised by 30^0C. Determine the displacements at nodes 2 and 3, stresses in the three sections. (12)

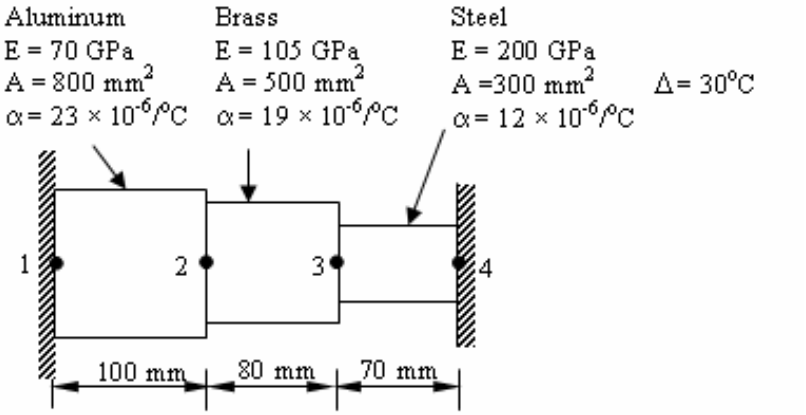

Fig. 2

4. a. Derive the B matrix (strain-displacement) for a Constant Strain Triangle (CST) element using area coordinates. (6)
   b. Calculate the surface loads for the triangle element shown in fig. 3. (6)

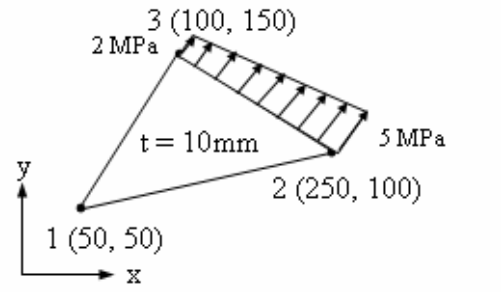

Fig. 3

5. a. Explain in detail the applications of isoparametric elements in two and three dimensional stress analysis. (6)

b. Using Gaussian quadrature evaluate the following integral $\int_{-1}^{+1}(4\xi+\xi^3)d\xi$.

(6)

6. Calculate the conductance matrix $[K^{(e)}]$ and load vector $\{F^{(e)}\}$ for the triangle element shown in fig.4 . The thermal conductivities are $k_x = k_y = 4$ W/cm-^oC and h = 0.3 W/cm^2 ^oC. Thickness of the element is 1cm. All coordinates are given in cms. Convection occurs on the side joining modes *i* and *j* (12)

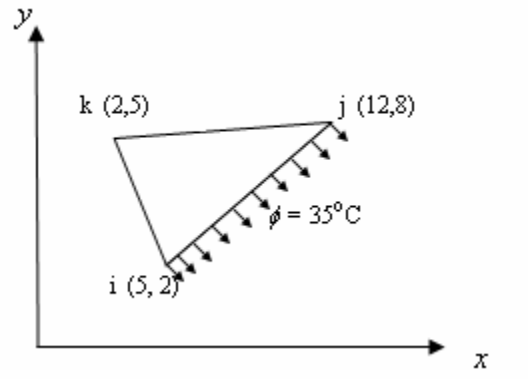

Fig. 4

7. Obtain the eigen values and eigen vectors for the cantilever beam of length 2m using consistant mass for translation dof with E = 200GPa, ρ = 7500kg/m^3. (12)

8. a. Discuss about Material and Geometric nonlinearity. (6)

b. Explain the solution methods for nonlinear algebraic equations. (6)

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