Reg. No. :

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Seventh Semester

Mechanical Engineering

14UME702 - FINITE ELEMENT ANALYSIS

(Regulation 2014)

Duration: One hour   Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. Which one is Numerical method?

    (a) Functional Approximation   (b) Finite Difference Method (FDM

    (c) Finite Element Method (FEM)   (d) All the above

2. . ...… method is most commonly used for solving simultaneous linear equations. This

    method is easily adapted to the computer for solving such equations.

    (a) Weighted residuals method   (b) Rayleigh-Ritz method
    (c) Gaussian Elimination method   (d) All the above.

3. When the aspect ratio increases, the accuracy of the solution

    (a) Increases   (b) Decreases

    (c) Neither increases nor decreases   (d) None

4. The derivative of sum of the shape functions within the element is equal to __

    (a) 0   (b) -1   (c) 1   (d) more than one

5. When there are less geometric nodes than shape function nodes then the element is called

    (a) Sub parametric   (b) Super parametric   (c) Iso parametric   (d) None

6. When thin plate is subjected to loading in its own plane only, the condition is called

     (a) Plane stress   (b) Plane strain   (c) Axi-symmetric   (d) General

7. All the calculations are made at limited number of points known as

     (a) Elements   (b) Nodes   (c) Discretization   (d) Mesh

8. Sum of shape functions is

     (a) +1   (b) -1   (c) 0   (d) Infinity

9. ANSYS uses
     (a) frontal solution   (b) banded matrix solution

     (c) Cramer's rule   (d) Cholesky decomposition

10. The normal stress is the same in all directions at a point in a fluid, when the fluid is
     (a) non-viscous

     (b) incompressible

     (c) both (a) and (b)

     (d) having no motion of one fluid layer relative to the other.

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PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

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11.   Explain the various steps involved in finite element method.   (8)

12. Find out nodal displacement for a truss show in figure, Consider the Area and young modulus of truss elements are 1500 mm^2 and 2*10^5 N/mm^2 respectively.

                                                       (8)

<div align="center">2</div>

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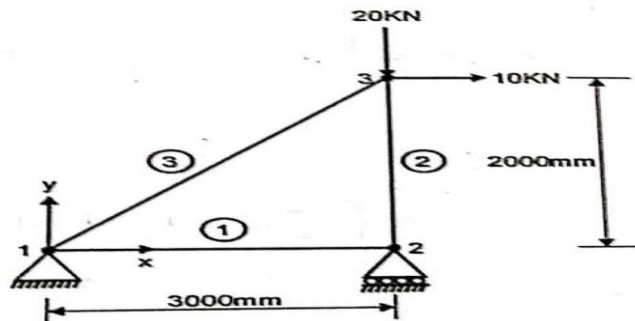
13. Derive the displacement interpolation matrix H, strain-displacement interpolation matrix B, and Jacobian operator J for the three node truss element shown in figure

(8)
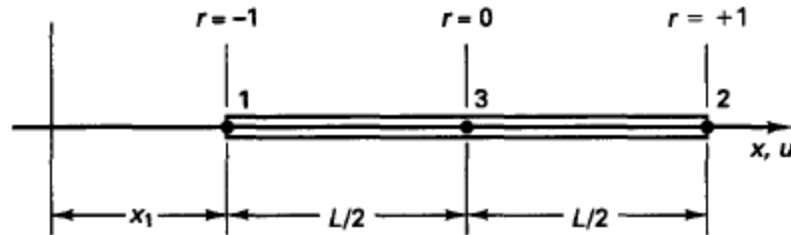
Figure

14. Consider the Eigen problem

$$K\phi = \lambda\phi \quad \text{with } K = \begin{bmatrix} 2 & & \\ & 2 & \\ & & 3 \end{bmatrix}$$

and show that the Eigen vectors corresponding to the multiple Eigen value are not unique. (8)

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15. A composite wall through which heat inside layer with K_1=0.02 W/cm^{0}C. The middle layer K_2=0.005 W/cm^{0}C and outer layer K_3=0.0035 W/cm^{0}C. The thickness of each layer 1.3cm,8cm and 2.5 cm respectively . Inside temperature of wall is 20^{0}C and outside temperature of the wall is -15^{0}C. Determine nodal temperature

(8)

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