Reg. No. : | | | | | | | | | | |

Question Paper Code: 47702

B.E. / B.Tech. DEGREE EXAMINATION, AUGUST 2021

Seventh Semester

Mechanical Engineering

14UME702 - FINITE ELEMENT ANALYSIS

(Regulation 2014)

Duration: 1:45 hour Maximum: 50 Marks

PART A - (10 x 2 = 20 Marks)

(Answer any ten of the following questions)

1. What is meant by discretization of domain?
2. Distinguish between local and global coordinate system.
3. How do you calculate the size of the global stiffness matrix?
4. List the properties of shape function.
5. What meant by plane stress analysis?
6. Give the salient feature of isoparametric element.
7. What is meant by path line?
8. What is the difference between lumped mass and consistent mass?
9. Mention two natural boundary conditions as applied to thermal problems.
10. Define heat transfer.
11. What is Rayleigh Ritz method?

12. State the principle of minimum potential energy.

13. Why polynomials are generally used as shape function?

14. How do you calculate the size of the global stiffness matrix**?**

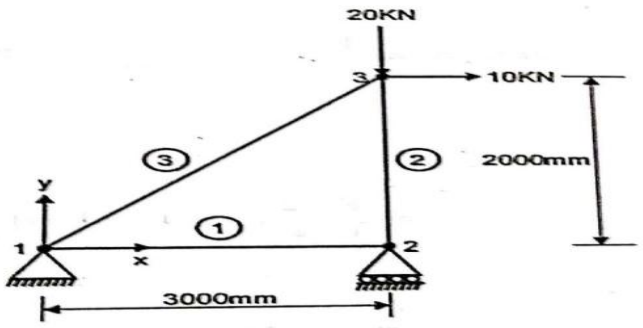
15. What meant by plane stress analysis?

PART – B (3 x 10= 30 Marks)

(Answer any three of the following questions)

11. Explain the various steps involved in finite element method. (10)

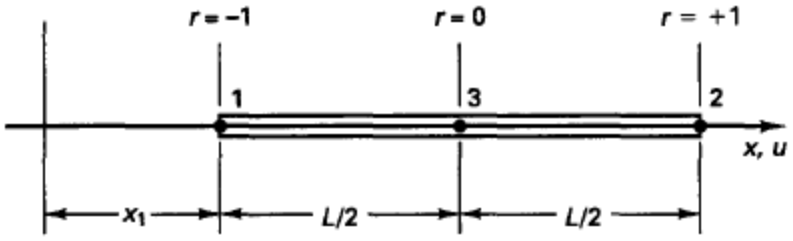
12. Find out nodal displacement for a truss show in figure, Consider the Area and young modulus of truss elements are 1500 mm^2 and $2*10^5$ N/mm^2 respectively.



(10)

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

(10)



Figure

14. Consider the Eigen problem

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

and show that the Eigen vectors corresponding to the multiple Eigen value are not unique. (10)

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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 (10)