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

Question Paper Code: 47702

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Seventh Semester

Mechanical Engineering

14UME702 - FINITE ELEMENT ANALYSIS

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

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

(a) 1 (b) 2 (c) 3 (d) 0

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. The global stiffness matrix is a singular matrix because its determinant is equal to --

(a) 1 (b) Zero (c) 2 (d) More than one

8. The solution by FEM is

(a) Always exact (b) mostly approximate

(c) Sometimes exact (d) never exact

9. The boundary condition which in terms of the field variables is known as

(a) Primary (b) Secondary (c) Natural (d) Essential

10. Thermal conductivity Kx=Ky=Kz in case of

(a) Isotropic material (b) Orthotropic material

(c) Anisotropic material (d) Homogenous material

PART - B (5 x 2 = 10 Marks)

11. Explain the Finite Element Analysis?

12. Mention the basic steps of Rayleigh Ritz method.

13. State the properties of stiffness matrix.

14. Explain the term Eigen value Problem

15. Mention two natural boundary conditions as applied to thermal problems.

PART - C (5 x 16 = 80 Marks)

16. (a) A simply supported beam subjected to Uniformly Distributed Load over entire span. Determine the bending moment and deflection at midspan by using Rayleigh Ritz method and compare with exact solution (16)

Or

(b) A bar of length L and uniform cross section of A is clamped at one end and left the other end and it is subjected to a uniform axial load of P at the free end. Calculate the displacement and stress in the bar using two terms of polynominal. (16)

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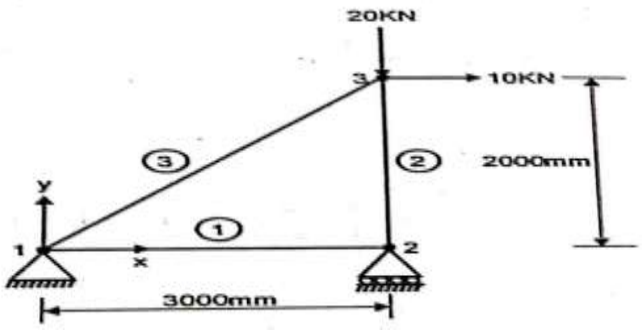
17. (a) Find out nodal displacement for a truss show in figure, Consider the Area and young modulus of truss elements are 1500 mm^2 and $2*10^5$ N/mm^2 respectively.



(16)

Or

(b) A concentrated load P=50KN is applied at the center of a fixed beam of length 3m,depth 200mm and width 120mm. Calculate the deflection and slope at the midpoint. Assume E=200GPa. (16)

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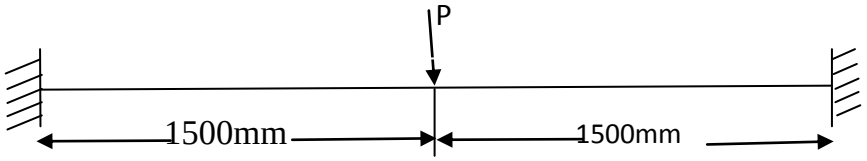

18. (a) A four noded rectangular element of length 2mm and height 1mm determine

(i) Jacobian matrix

(ii) Strain-displacement matrix

(iii) Element stresses. Taking E=200GPa, Poisson's ratio=0.25, Nodal displacements as (0, 0, 0.003, 0.004, 0.006, 0.004, 0, 0) with local coordinates of (0, 0). (16)

Or

(b) (i) Evaluate the integral $\cos(\pi x/2)\,dx$ by applying 3 point Gaussian approach with limit of -1 to +1. (8)

(ii) Evaluate the integral $e^{-x}\,dx$ by applying 3 point Gaussian approach with limit of -1 to +1. (8)

19. (a) Obtain the natural frequencies of vibration for a stepped steel bar of area $625mm^2$ for a length of 250mm and $312.5\ mm^2$ for a length of 125mm. The element is fixed at the larger end. (16)

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Or

(b) A simply supported beam of both end hinged supported has length of 1m and cross sectional area of $30cm^2$.Determine the natural frequency by taking two elements with lumped mass condition. Take $E=2X10^{11}N/mm^2$ and density as $7800kg/m^3$ (16)

20. (a) A steel rod of diameter 2cm, length of 5cm and thermal conductivity of 50W/m°C is exposed at one end to a constant temperature of 320°C.The other end is in ambient air of temperature 20°C with a convective coefficient of $100W/m^2°C$.Determine the temperature at the midpoint of the rod. (16)

Or

(b) A composite wall through which heat inside layer with $K_1=0.02\ W/cm^0C$. The middle layer $K_2=0.005\ W/cm^0C$ and outer layer $K_3=0.0035\ W/cm^0C$. The thickness of each layer 1.3cm,8cm and 2.5 cm respectively . Inside temperature of wall is 20^0C and outside temperature of the wall is -15^0C. Determine nodal temperature (16)