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

Question Paper Code: 22061

M.E. DEGREE EXAMINATION, MAY 2014.

Second Semester

Structural Engineering

01PSE201 - FINITE ELEMENT ANALYSIS FOR STRUCTURAL ENGINEERING

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

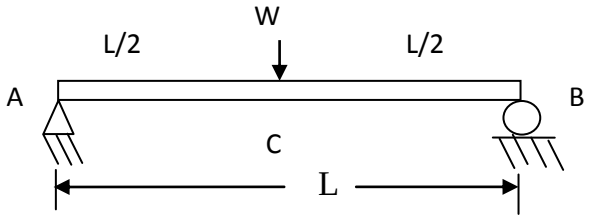
1. List the advantages of Finite Element Method over other methods of analysis.
2. What is meant by DOF?
3. State the two important properties of shape function.
4. Define plane strain.
5. Define discretization of a structure.
6. What is meant by two dimensional element?
7. Why numerical integration is required for evaluation of stiffness of an iso parametric element?
8. What is meant by forced vibration?
9. Name any four software packages used for finite element method of structural analysis.
10. What is dynamic condensation?

PART - B (5 x 14 = 70 Marks)

11. (a) Generate the shape functions for a quadratic bar element using polynomial approach. Use natural coordinates which various from -1 to +1. (14)

Or

(b) A beam AB of span L is simply supported at ends carrying a concentrated load 'W' at the centre 'C' as shown in figure. Determine the deflection at mid span by using Rayleigh Ritz method and compare with the exact solution.



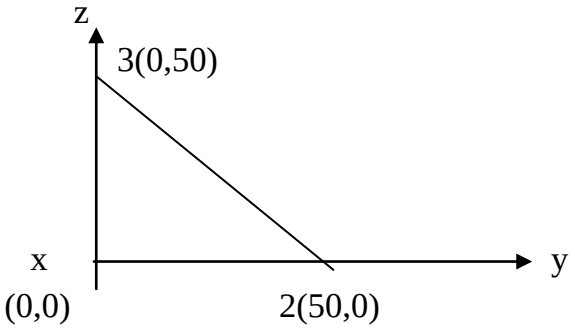
(14)

12. (a) Derive an expression for the shape function for a the constant triangular element. (14)

Or

(b) The nodal coordinates of a three nodded triangular element are (10,7.5),(15,5)and (15,10) respectively. The coordinates are given in millimeters. Assume plane stress conditions. Let E = 210 GPa, θ = 0.25 and t = 10mm. Evaluate the stiffness matrix for the element. (14)

13. (a) For the axisymmetric element shown in figure, determine the stiffness matrix. Let E = 2.1×10^5 N/mm^2 and V = 0.25. The co-ordinates are in millimeters.



(14)

Or

(b) A continuous beam AB = 15m, BC = 10m is fixed at A and hinged at B and C. It is loaded with a concentrated load of 30kN at a distance of 10m from A and a udl of 15kN/m for the portion BC. Treating AB and BC as two bending elements, find the structure stiffness matrix using direct stiffness method and find the modal DoF. Take EI = Constant. (14)

14. (a) Explain Eigen value extraction and application to thermal analysis problem. (14)

Or

(b) A steel rod of 2 cm in length and thermal conductivity k = 50W/m^{o}C is exposed at one end to a constant temperature of 320^{o}C. The other end is an ambient air temperature of 20^{o} C with a convection co - efficient of h = 100 W/m^{2o}C. Determine the temperature at midpoint of the rod. (14)

15. (a) Explain the application of software packages in finite element method of analysis. (14)

Or

(b) Explain the post - processor and pre - processor in FEA. (14)

PART - C (1 x 10 = 10 Marks)

16. (a) Explain material and geometric nonlinearity and its method of treatments. (10)

Or

(b) Consider any one plate bending problem and discuss the application of modelling procedure using software. (10)

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