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M.E DEGREE EXAMINATIONS: JUNE 2011

Second Semester

STRUCTURAL ENGINEERING

SEE505: Finite Element Analysis

Time: Three Hours **Maximum Marks: 100**

Answer all questions:-

PART A (10 x 2 = 20 Marks)

1. Define: Shape function.
2. What are the methods used for finite element formulation?
3. What is weak formulation?
4. What are the advantages of natural coordinates?
5. What do you mean by isoparametric formulation?
6. What is meant by adaptive mesh?
7. When the element is called ill-conditioned?
8. How the error is finite element is evaluated?
9. What do you mean by dynamic condensation?
10. What type of approach is used for the thermal analysis?

PART B (5 x 16 = 80 Marks)

11. a) (i) Why are exact solutions difficult to obtain in structural analysis? (8)

(ii) Using a simple example, explain the Rayleigh-Ritz formulation. (8)

[OR]

b) (i) Determine the bending moment and deflection at centre of the given beam in fig 11 b i) using Galerkin's method

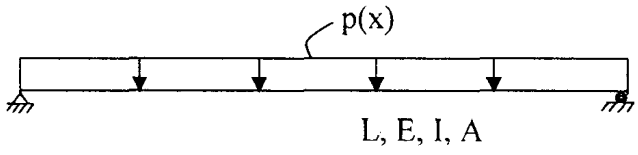

Fig 11 b i)

12. a) (i) Derive the shape functions for a triangular element. (8)

(ii) Analyze the truss, subjected to a concentrated load of 150 kN as shown in fig 12 a ii) (8)

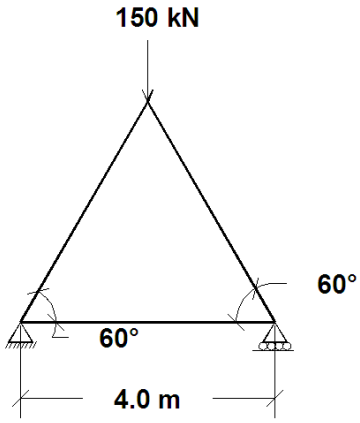

Fig 12 a ii)

[OR]

b) (i) Derive the interpolation polynomial for a two-dimensional simplex element. (8)

(ii) Find the stresses induced in the axially loaded stepped bar shown in fig 12 b ii) (8)

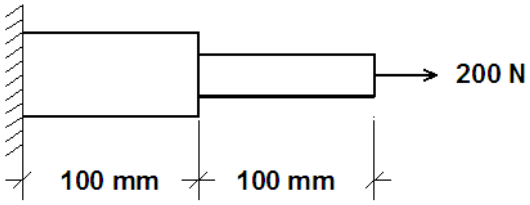

Fig 12 b ii)

The bar is having a cross sectional area of 200 sq.mm. for the first 100mm and an area of 100 sq.mm. for the remaining 100 mm. E=200 GPa and the force applied is 200 N.

13. a) Derive the interpolation function for a higher order three dimensional tetrahedron element

[OR]

b) Explain the following: Auto mesh generation, Discretisation errors.

14. a) Formulate the individual element stiffness matrices for the truss shown in Figure 14 a. Assume a vertical downward load of 1 kN at node 4

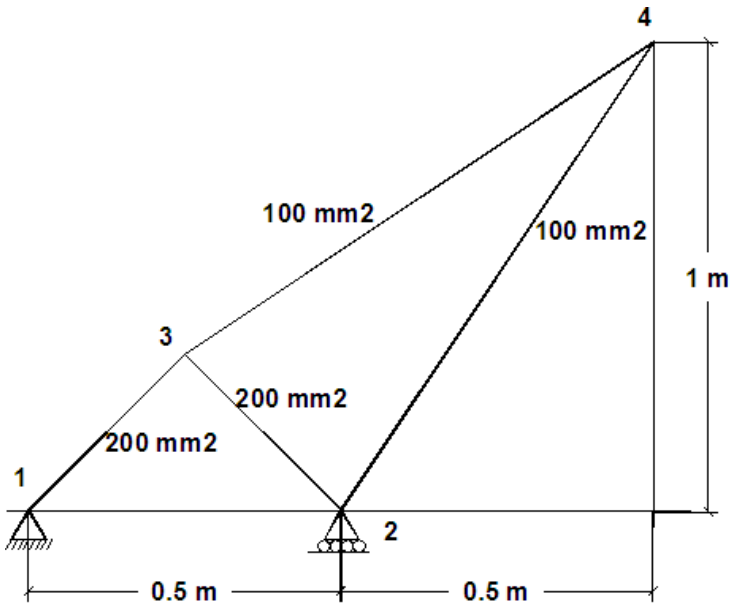

Fig 14 a

[OR]

b) Explain the following: Consistent mass matrix, Geometric non-linearity.

15. a) Explain the general requirements of Preprocessing and Post-processing and Methods of finite element model generation.

[OR]

b) Write short note on Finite Element Analysis Software and commercially available FEM software packages.

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