Q 8037

M.E. DEGREE EXAMINATION, MAY/JUNE 2006.

First Semester

Computer Aided Design

CD 1602 — FINITE ELEMENT ANALYSIS

(Common to M.E. CAD/CAM and M.E. Engineering Design)

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What do you understand by discretization of domain?

2. What role did the computer play in the use of the finite element method?

3. Distinguish between local and global coordinate system.

4. Define CST element.

5. What do you mean by isoparametric element?

6. Define transformation mapping.

7. Write down the consistent mass matrix for a bar element.

8. Clearly explain about the classification of direct integration techniques.

9. A burner is heating a spot on a two dimensional body. How do you attempt to model this?

10. What is the effect of mesh size on the accuracy of solution?

PART B — (5 × 16 = 80 marks)

11. (i) Derive the governing equation for one dimensional steady state conduction.

(ii) A brick wall of thickness 50 cm, k= 0.7 w/m°C as shown in figure inner surface is at 30°C and the outer surface is exposed to cold −15°C. The heat transfer coefficient associated with the outer surf h = 40 w/m² °C. Determine the steady state temperature distrib with in the wall.
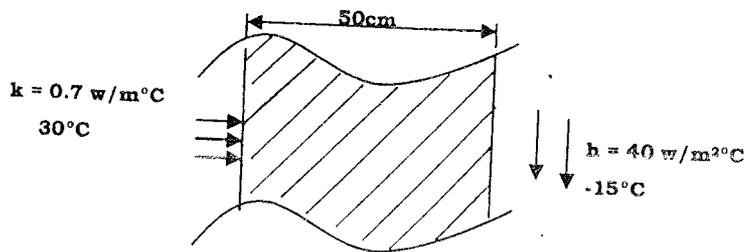

Figure. 1

12. (a) Briefly explain the step by step procedure for finite element analysis an illustration.

Or

(b) A steel bar element as shown in figure 2. is subjected to axial force at locations. The bar is rigidly fixed at one end free to displace by 3.5 mm the other end. Determine the nodal displacement.
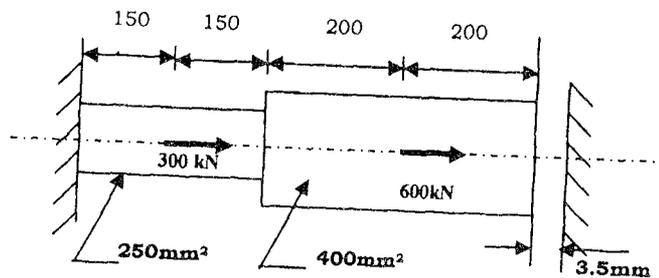

Figure 2

13. (a) Derive the element characteristics matrix for a one dimensional lin element using quadratic interpolation function. (16

Or

(b) Derive element mass matrix for CST element. (16

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(a) Determine the displacement of nodel and the stress in element 1-3 for the truss shown in figure 3.
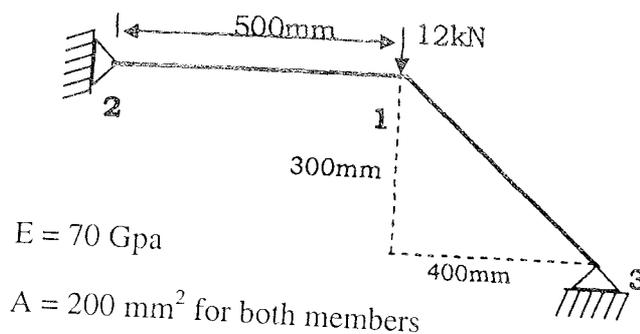
(16)

$E = 70$ Gpa

$A = 200$ mm^2 for both members

Figure 3

Or

(b) Write short notes on :

(i) Higher order elements

(ii) Meshing techniques.

(8)

(8)

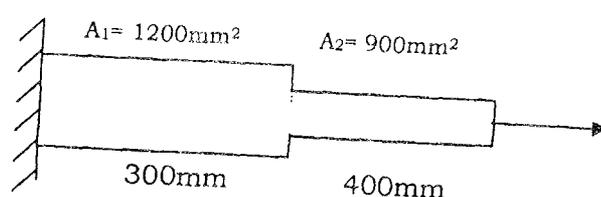15. (a) Derive the global stiffness matrix for a axially vibrating steel bar as shown in figure 4.

(16)

Figure 4

Or

(b) A uniform cross section bar of length L made up of a material whose young's modulus and density are given by E and ρ. Find the natural frequency of axial vibration of the bar using consistent mass matrix. (16)

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