Z 6409

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Second Semester

Structural Engineering

ST 1654 — COMPUTATIONAL METHODS

(Regulation : 2005)

Three hours — Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What do you mean by 'modelling' of an actual problem?

2. What are the types of modelling?

3. Define 'flexibility influence coefficient'.

4. What is degree of kinematic indeterminacy?

5. What are the factors which influence the establishment of a finite element model of an actual practical problem?

6. Use of parabolic elements is recommended. Why?

7. What is shape function?

8. What do you mean by material non linearity?

9. Give any two examples for the dynamic problems.

10. Write down the consistent mass matrix for bar element.

PART B — (5 × 16 = 80 marks)

11. (a) Explain the use of isoparametric elements used in the analysis for different types of problems. (16)

Or

(b) Describe 'Solid modelling' and all the features associated with it. (16)

12. (a) Analyse the continuous beam shown in Fig. 1 by stiffness method. Draw the bending moment diagram.

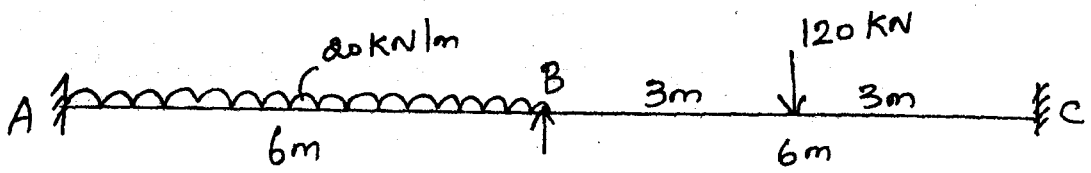

Fig. 1

Or

(b) Analyse the pin jointed structure shown in Fig. 2 by flexibility method. The cross sectional area of each member is 2000 mm^2.

Assume $E = 2 \times 10^5$ N/mm^2.

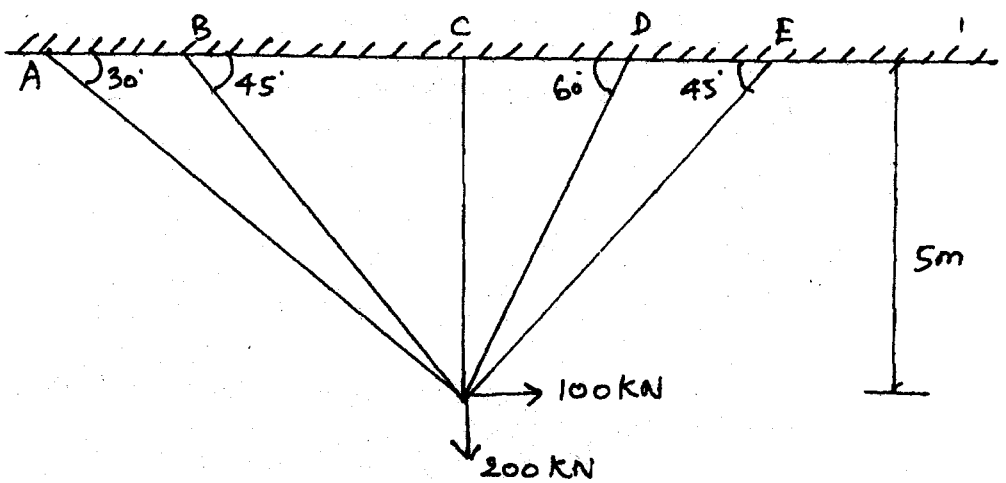

Fig. 2

13. (a) Fig. 3 shows a typical continuous beam. Obtain the deflection of the beam using the element. For simplicity assume EI = 1.

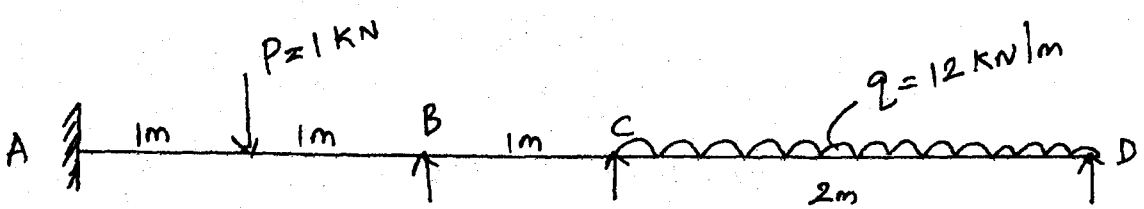

Fig. 3

Or

A simple framed structure made up of steel as shown in fig. 4. Obtain the deflections using the frame element.

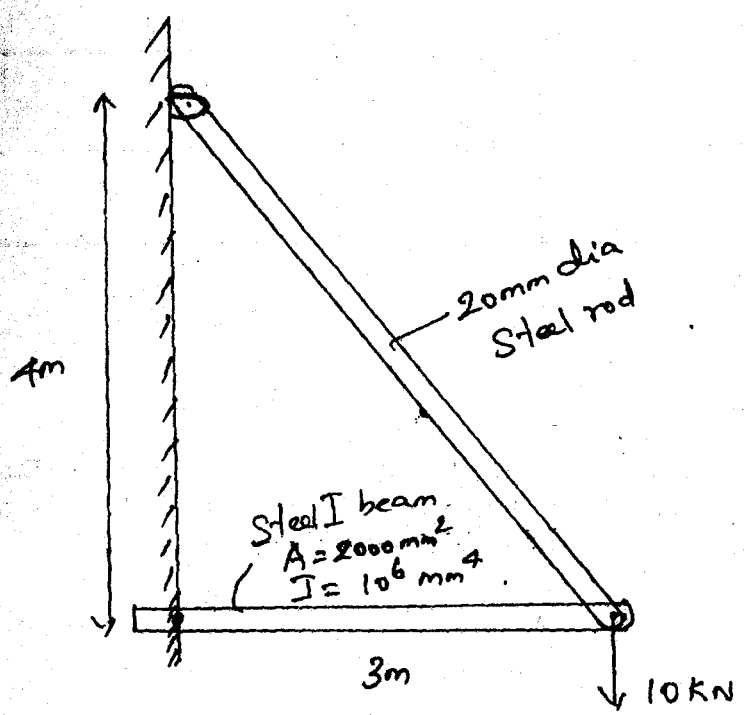

Fig. 4

(a) Determine the deflection of a thin plate subjected to extensional loads as shown in Fig. 5. Use two CST elements to solve this problem.

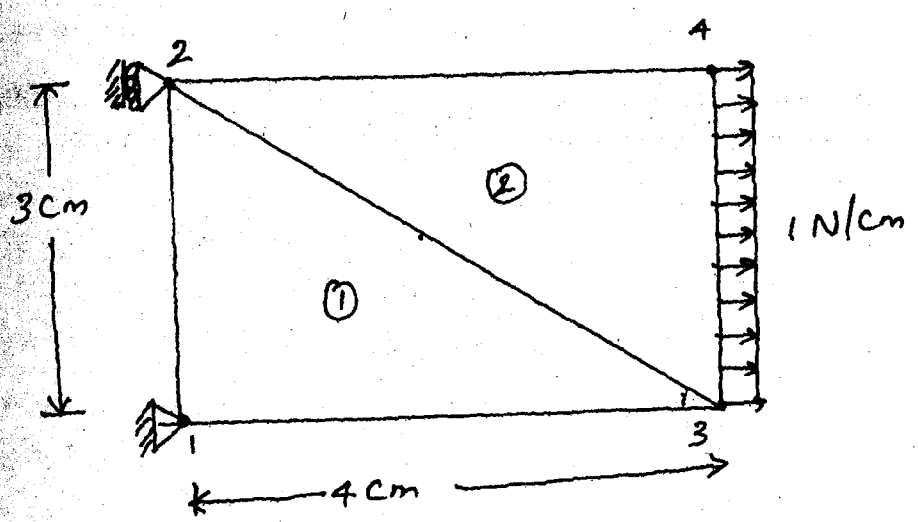

Fig. 5

Or

(b) Write all the shape functions for the elements shown in Fig. 6.

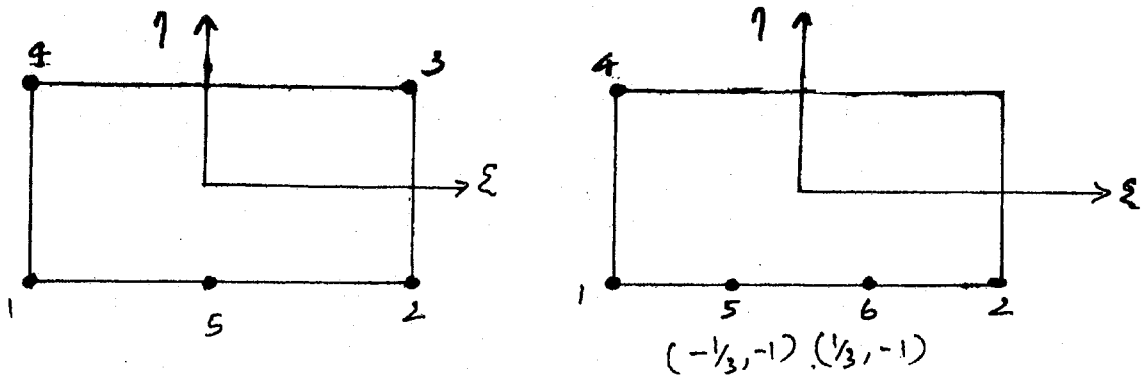

Fig. 6

15. (a) Consider the undamped 2 d.o.f. system shown in Fig. 7. Find the response of the system when the first mass alone is given an initial displacement of unity and released from rest.

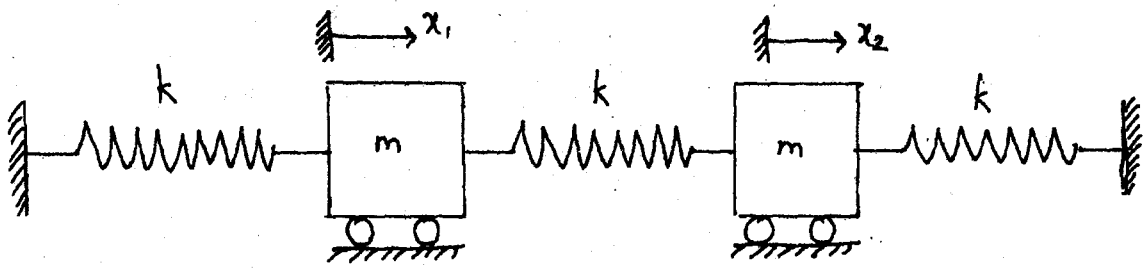

Fig. 7

Or

(b) Determine the two eigen values and eigen vectors corresponding to the two non-zero masses, using the method of subspace iteration.

$$K = \begin{bmatrix} 2 & -1 & 0 & 0 \\ -1 & 2 & -1 & 0 \\ 0 & -1 & 2 & -0 \\ 0 & 0 & -1 & 1 \end{bmatrix}, \qquad M = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$