Register Number..........................

M.E. DEGREE EXAMINATIONS: DECEMBER 2009

First Semester

STRUCTURAL ENGINEERING

SEE502: Matrix Methods of Structural Analysis

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

Answer All the Questions:-

PART A (10 x 2 = 20 Marks)

1. State the principle of superposition of forces.
2. Obtain the stiffness matrix from the flexibility matrix $[a] = \begin{bmatrix} 4 & 2 \\ 2 & 3 \end{bmatrix}$
3. Write the flexibility matrix for the coordinates shown in fig. 1.

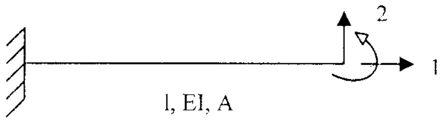

Fig. 1

4. What are generalized coordinates?
5. What is meant by static condensation?
6. List the properties of structure stiffness matrix.
7. Is it possible to set up flexibility matrix of an unstable structure?
8. What is a released structure?
9. List any four software packages that are useful for the analysis of structures.
10. What do you mean by a preprocessor and a postprocessor?

PART B (5 x 16 = 80 Marks)

11. (a) (i) The displacement method is often preferred in general. Justify. (6)

(ii) Form stiffness matrix for the spring system shown in fig.2. (10)

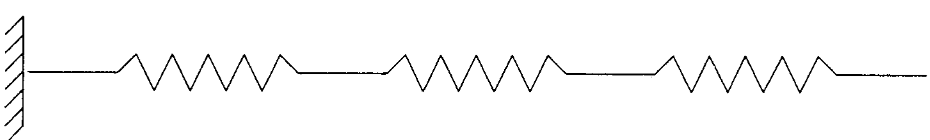

Fig. 2

(OR)

b) Analyze the frame shown in fig. 3 by the stiffness method.

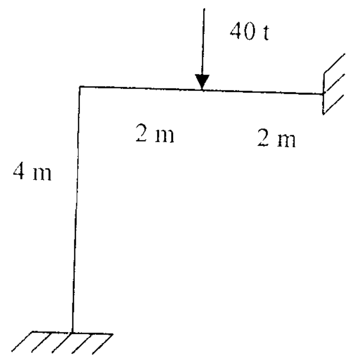

Fig. 3

12. (a) (i) State and explain Betti's law with an example. (6

(ii) Compare and contrast between flexibility and stiffness methods. (1

(OR)

(b) Develop the displacement matrix and find the system stiffness matrix. Using structure stiffness method, find the element forces of the plane frame shown in fi Draw BMD and assume EI as constant. Assume axial deformations are negligi

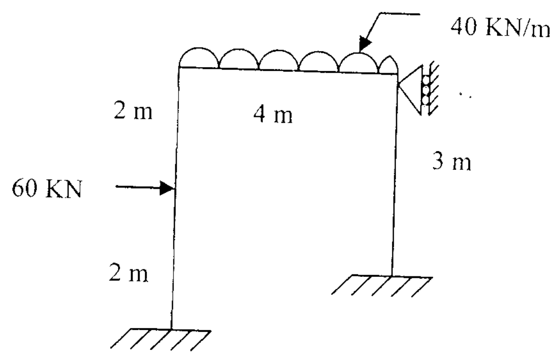

Fig.4

13. (a) Determine the displacement and internal forces for the truss shown in fig.5.

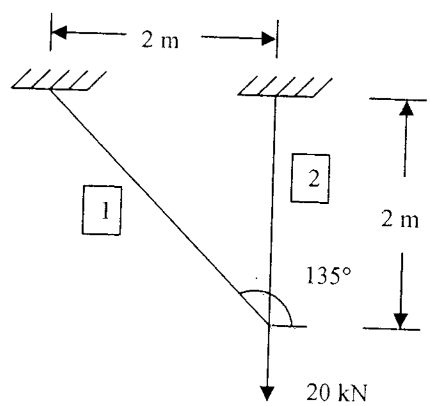

Fig. 5

(OR)

(b) Form the stiffness matrix for the frame shown in fig. 6.

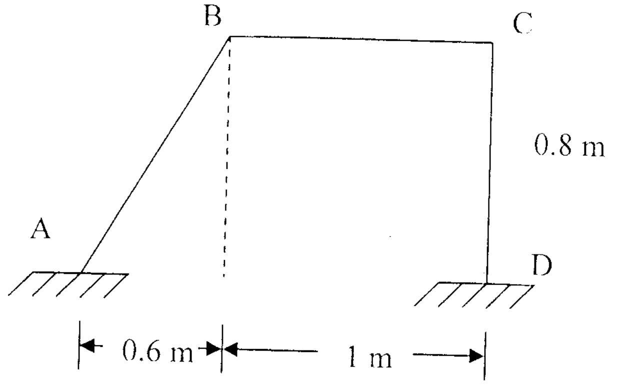

Fig. 6

14. (a) Analyse the continuous beam shown in fig. 7 by flexibility method. Draw BMD.

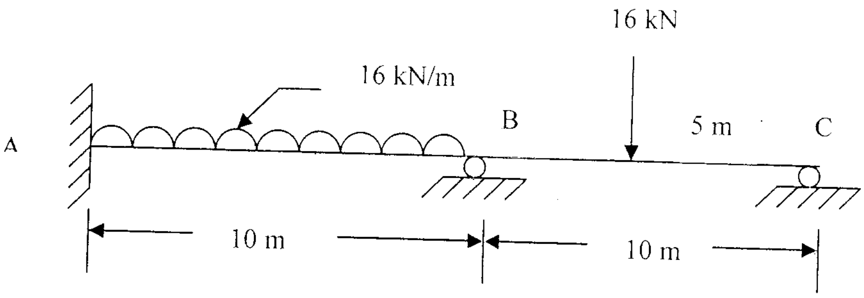

Fig. 7

(OR)

(b) Find the forces in members of the truss shown in fig. 8 due to lack of fit of the members as indicated below. Take E = 210 GPa.

Member No	Length (m)	Area (mm^2)	Lack of fit (mm)
1	2.0	1600	5
2	1.5	1600	-2
3	3.0	1600	0
4	1.5	1600	1
5	2.5	800	-1
6	2.5	800	0

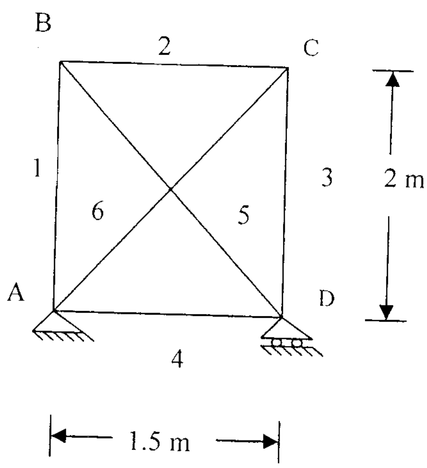

Fig. 8

15. (a) Create an input file for the analysis of a portal frame loaded as shown in fig.9. T frame is to be analysed by STAAD package.

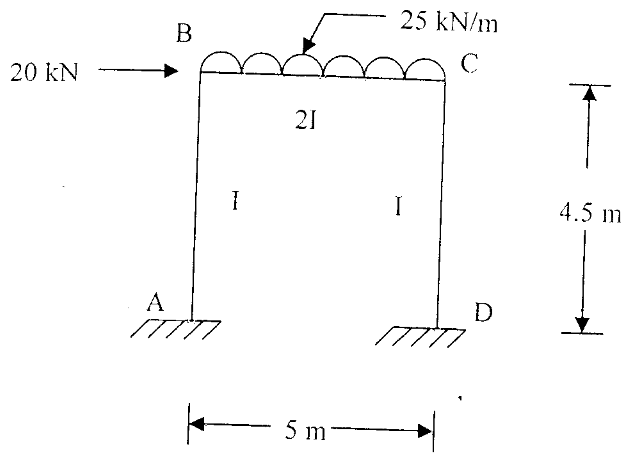

Fig. 9

(OR)

(b) (i) What are the advantages of computer aided analysis and design? (6)

(ii) Write a computer program using any high level language to obtain the syste flexibility matrix [a] from the element flexibility matrix [α] and the for transformation matrix [b] using the relation $[a] = [b]^T [\alpha] [b]$. (10

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