(Please write your Exam Roll No.) *Exam Roll No.* 028

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH.] DECEMBER-2010

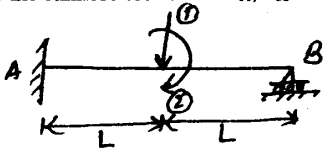
Paper Code: ETCE301 **Subject: Structural Analysis-III**

Time : 3 Hours **Maximum Marks :75**

Note: Attempt one question from each unit including Q.1 which is compulsory.

Q1 (a) What are the assumptions made in the portal and cantilever methods? **(3)**

(b) Determine the stiffness coefficients S_{11}, S_{22} and S_{12} for the beam shown in fig.1 **(3)**



(c) Briefly explain the static and Kinematic Indeterminary. **(3)**

(d) Determine the static and Kinematic indeterminary of the frame shown in fig.2. **(2)**

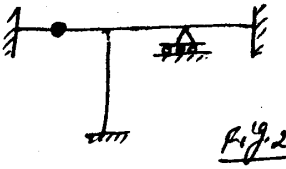


Fig.2

(e) The number of unknowns to be determined in the stiffness method is equal to- **(1)**

(i) Static Indeterminary (ii) Kinematic Indeterminary

(iii) Sum of static and kinematic indeterminary (iv) None of the above

(f) Which of the following is true with regard to the flexibility method of analysis? **(1)**

(i) The method is used to analyse determinate structures.

(ii) The methods is used only for manual analysis of indeterminate structures.

(iii) The method is used for analysis of flexible structures.

(iv) The method is used for analysis of indeterminate structures with lesser degree of static indeterminary.

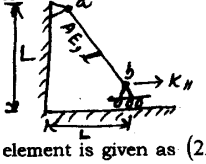
(g) Horizontal stiffness coefficient K_{11} of bar 'ab' shown in fig.3 is given by- **(2)**

(i) $AE/l\sqrt{2}$

(ii) $AE/2l$

(iii) AE/l

(iv) $2AE/l$



(h) The stiffness matrix of a beam element is given as $(2EI/L)\begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}$, the flexibility matrix is- (i) $(L/2EI)\begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}$ (ii) $(L/6EI)\begin{bmatrix} 1 & -2 \\ -2 & 1 \end{bmatrix}$

(iii) $(L/3EI)\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ (iv) $(L/5EI)\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$. **(2)**

(i) At any cross-section of a beam curved in Plan, there is- **(1)**

(i) Shear force and bending moment

(ii) Shear force and twisting moment

(iii) Bending moment and twisting moment only

(iv) Shear force, bending moment and twisting moment.

(j) If the beam curved in plan as shown in fig.4 is subjected to unit torque at free end (point A), the rotation of free end is- **(2)**

(i) $\frac{L}{GJ}+\frac{L}{EI}$ (ii) $\frac{L}{GJ}+\frac{L}{2EI}$

(iii) $\frac{L}{2GJ}+\frac{L}{2EI}$

(iv) None of the above.

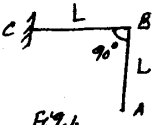


Fig.4

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(k) Briefly explain Castigliano's Theorems of strain energy and its applications in structural analysis. **(3)**

(l) Which method of matrix analysis is more suited for computer application? Why is it so? **(2)**

UNIT-I

Analysis the frame shown in fig.5 by cantilever method. Show the results by drawing the moment diagram for the entire frame. Take cross-sectional areas of all the columns as the same. **(12.5)**

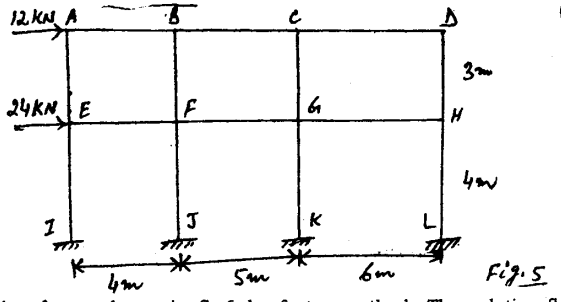

Fig. 5

Analyse the building frame shown in fig.6 by factor method. The relative flexural stiffnesses of the members are shown in Parentheses. **(12.5)**

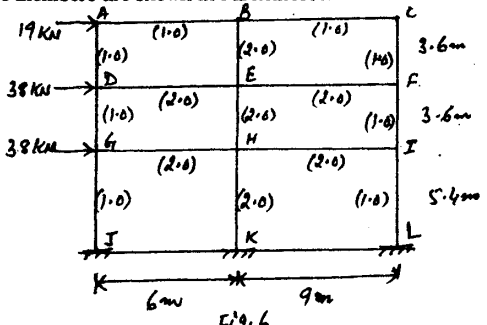

Fig. 6

UNIT-II

Analyse the portal frame ABCD shown in fig.7 by flexibility matrix method. Take EI as constant throughout. **(12.5)**

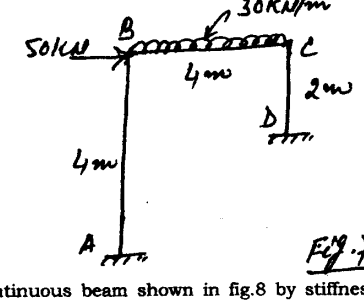

Fig. 7

Analyse the continuous beam shown in fig.8 by stiffness matrix method. Take EI as constant throughout. **(12.5)**

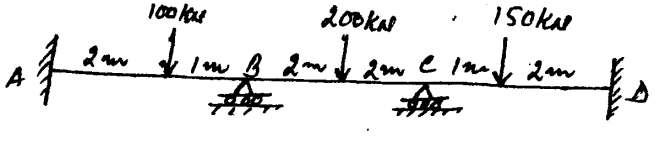

Fig. 8

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UNIT-III

Q6 Analyse the Pin-jointed plane frame shown in fig.9. The axial stiffness for each member is 400KN/cm. **(12.5)**

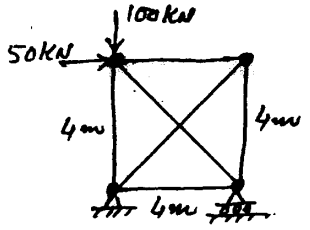
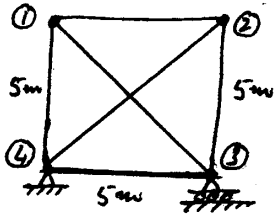


Fig. 9

Q7 Construct the direct stiffness matrix K for the truss shown in fig.10. The nodes to be numbered as shown. Take $E=200\times10^6 KN/m^2$. Area of each member $A=2500mm^2$. **(12.5)**



Q8 (a) A rigid horizontal bent ABCD of uniform cross-section is fixed at A and D as shown in fig.11. The bent is subjected to uniformly distributed load 'ω' over the entire length. Determine the bending moment and twisting moment at E_1 the centre of BC. **(10)**

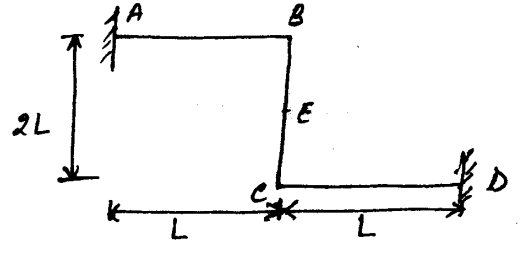


Fig. 11

(b) What are the advantages of Finite Element Method over Analytical Method? **(2.5)**

Q9 (a) A quarter circle beam of radius R curved in plan is fixed at end A and free at end B as shown in fig.12. It carries a vertical load P at its free end. Determine the deflection at the free end and sketch the shear force, bending moment and torsional moment diagrams. Assume flexural rigidity EI=torsional rigidity GJ. **(9)**

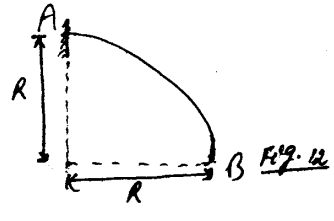


Fig. 12

(b) Write down the steps involved in the Finite Element Modelling. **(3.5)**

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