(Please write your Exam Roll No.) Exam Roll No. 07120734O

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH.]- DECEMBER 2009

Paper Code: ETCE-301 **Subject: Structural Analysis-III**
Paper ID: 34301

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

Note: Q.No.1 is compulsory. Attempt one question from each unit.

Q.1 (a) What are the type of loads for which the portal and cantilever methods of approximate analysis are applicable? (1)

(b) What are the assumptions made in methods stated in (a) above. (3)

(c) What do you understand by stiffness, stiffness influence coefficient and Joint Load? (3)

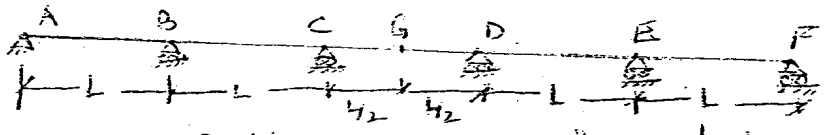
(d) What do you understand by flexibility and flexibility influence coefficient? What are the characteristics of a flexibility matrix? (3)

(e) State Castigliano's Theorems of strain energy. What are the applications of these theorems in structural analysis? (3)

(f) Name the matrix method of structural analysis for following cases with respect to Analysis of continuous beams in which we use: -(i) Statically determinate spans (ii) Kinematically determinate spans. (2)

(g) Which methods of matrix analysis is more suited for computer application? Why is it so? (2)

(h) A continuous beam with equal spans is shown Fig.1. Show the loading system of imposed loads that will cause: - (i) Maximum B.M. at support C. (ii) Maximum B.M. at around mid span section of span CD i.e. at or around G. (3)



Continuous Beam with equal spans

Fig 1

(i) Determine internal and external statical indeterminacy of plane truss shown in Fig.2. (2)

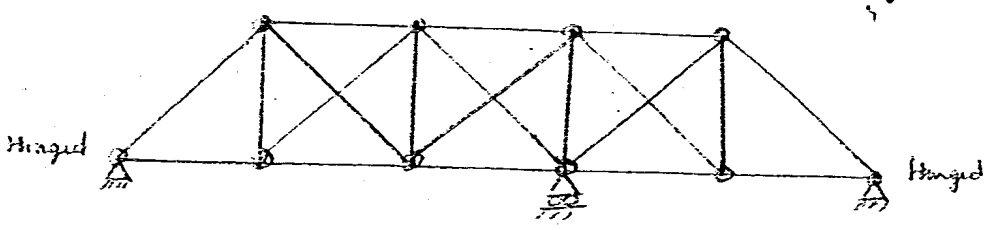


Fig 2

Note : All joints are encircled

(j) The truss of Fig.2 is to be analyzed by matrix method using 'manual calculations'. Which method is better suited and why? The choice is between Flexibility and Stiffness Matrix Methods. (3)

UNIT-I

Q.2 For the plane rigid frame shown in Fig.3, work out:-

(a) Statical indeterminacy. (4)

(b) Kinematic indeterminacy neglecting axial displacements of all members. (4.5)

(c) Kinematic indeterminacy considering axial displacement of all members. (4)

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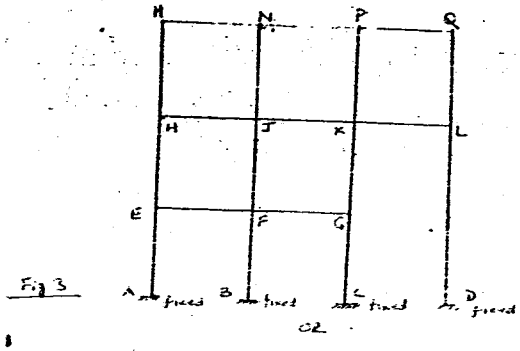
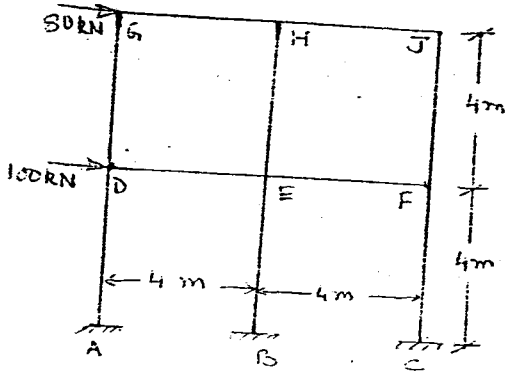


Fig 3

Q.3 The plane rigid frame shown in Fig.4 is fixed at all the supports. Analyze the frame by Factor Method. Draw S.F. and B.M. diagrams. Plot B.M. diagrams on tension side. It is given that moment of inertia is '2I' for all beams and "I" for all columns. **(12.5)**



UNIT-II

Q.4 Analyze the continuous beam shown in Fig.5 by Flexibility Matrix Method. Identify and clearly indicate the redundant actions chosen by you. Calculate displacements and flexibility coefficients preferably by numerical integration. Determine all support reactions and plot S.F. Diagram. **(12.5)**

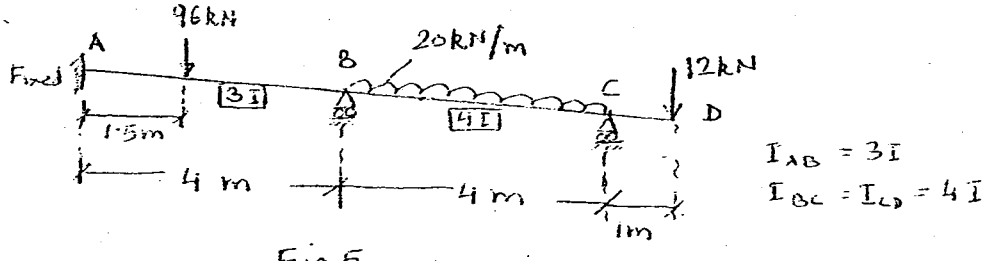


Fig 5

Q.5 A stepped beam is shown in Fig.6. The members, joints and co-ordinates are numbered as shown. Identify and indicate unrestrained and restrained displacement matrices. Using "stiffness matrix method" work out the "member end actions". Find out supports reactions from the "member end actions". **(12.5)**

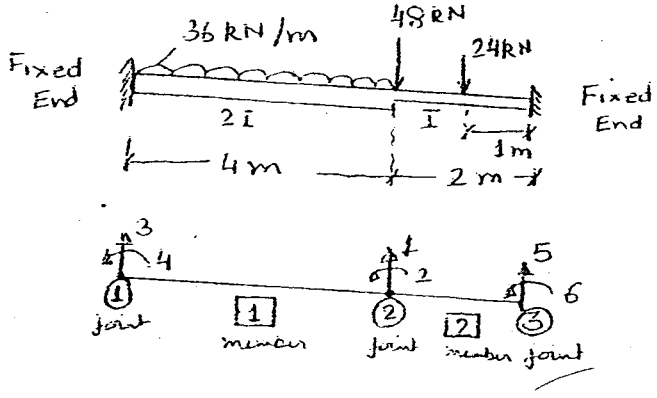


Fig 6

UNIT-III

Q.6 Identify the unrestrained and restrained displacement matrices for the plane rigid frame shown in Fig.7. The co-ordinates are to be numbered as shown. Determine member end actions by stiffness matrix method. Plot B.M. Diagram on tension side. **(12.5)**

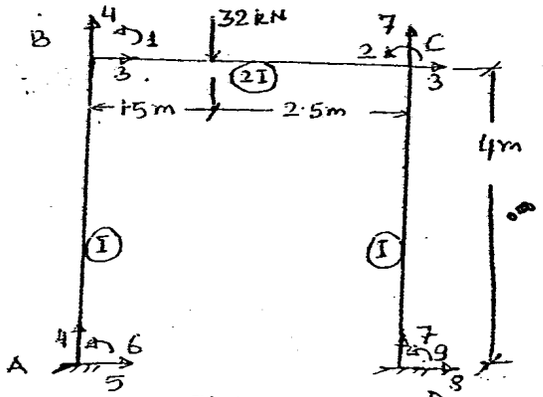


Fig 7

Q.7 Describe the rotation matrix for a space truss element. Also indicate the rotation matrix for the specific case of vertical member of this space truss element. **(12.5)**

UNIT-IV

Q.8 A Beam is bent in plan and loaded as shown in Fig.8. What is the statical indeterminacy of this beam? Analyze the beam an plot its Bending and Torsional moment diagrams. Take EI/GJ = 1.5. **(12.5)**

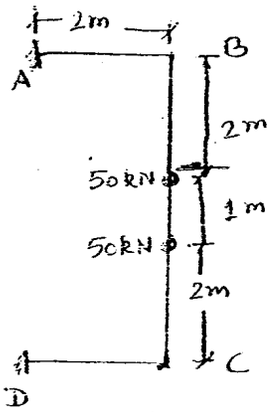


Fig 8

Q.9 A 22.5 meters long beam as shown in Fig.9 is supported on continuous elastic support whose modulus of foundation sub grade is 1 x10^5 KN/m^2. The beam is 1m X 1m in cross. Cross section and its young's modulus of elasticity is 2 x 10^7 KN/m^2. It is loaded as shown in Figure. Determine B.M. at every 4.5 m sections and plot B.M. diagram on tension side. **(12.5)**

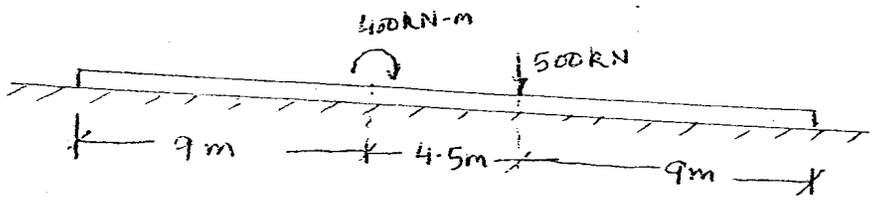


Fig 9

$I = \frac{d d^3}{12}$

$[\Delta] = \Delta L + [S][P]$

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