Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –Ist SEMESTER–EXAMINATION – JULY- 2012

Subject code: 712001N **Date: 05/07/2012**

Subject Name: Advanced Structural Analysis

Time: 2:30 pm – 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Derive the flexibility matrix of portal frame by selecting H_d, M_d and V_d taken as redundant reaction (fig. 1). **08**

(b) Derive the stiffness matrix of beam as shown in fig. 2, with taking rotations at supports taken as unknown. **06**

Q.2 **(a)** Elaborate basic principles of sub structuring and its advantages. **07**

(b) Considering non-linear deformation derive member stiffness matrix for truss element. **07**

OR

(b) What are the methods available to solve simultaneous equation? Elaborate with advantages. **07**

Q.3 **(a)** Analyze the truss as shown in fig. 3 by flexibility method. The c/s areas of members are as follows. **10**

Member	Area (mm^2)
AB	6000
BC	6000
CD	6000
DE	3000
EF	3000
FA	3000
BF	3000
BE	3000
CF	3000
CE	3000

(b) Explain the concept of stiffness matrix method **04**

OR

Q.3 **(a)** Determine the forces in the truss as shown in fig. 3, due to rise in temperature of entire truss by 20^0. Coefficient of thermal expansion of the material of truss is 12×10^{-6} /^{0}C. **10**

(b) Derive basic stiffness matrix using the governing differential equation and imposing the approximate displacement boundary condition. **04**

Q.4 **(a)** Analyze the truss as shown in fig. 4 by stiffness matrix method. Adopt c/s area of all members are 1000 mm^2 and $E = 2 \times 10^5$ MPa. **10**

(b) Explain the concept of rotation of axes in two dimensions. **04**

OR

Q.4 **(a)** Explain the concept of flexibility method. **07**

(b) Explain the principle of virtual work with example. **07**

Q.5	**(a)**	Considering axial-flexural interaction derive the stiffness matrix of a plane frame element.	**07**
	(b)	What are the methods available for non linear analysis? Elaborate them.	**07**

OR

Q.5	**(a)**	Considering axial-flexural interaction derive the flexibility matrix of a plane frame element.	**07**
	(b)	Explain the "Non linearity in structure" with typical examples.	**07**

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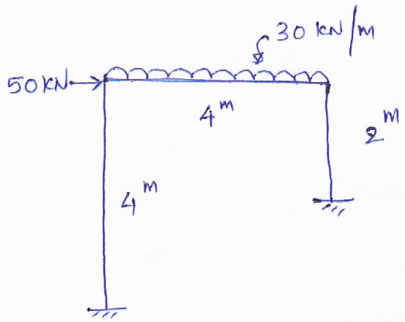

Fig. 1

(Q. 1 (a))

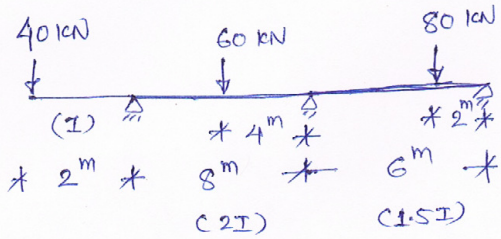

Fig. 2

(Q. 1 (b))

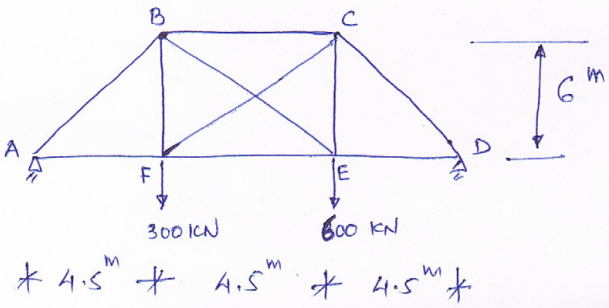

Fig. 3

(Q. 3 (a))(OR Q. 3 (a))

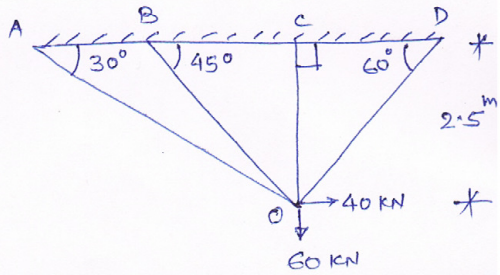

Fig. 4

(Q. 4 (a))

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