Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– I (OLD course)• EXAMINATION – SUMMER 2015

Subject Code: 712001 **Date: 11/05/2015**

Subject Name: Advanced Structural Analysis

Time: 10:30 am to 1:00 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) What is nonlinearity? Explain types of nonlinearity in brief. [07]

Q 1 (b) Develop overall joint stiffness matrix for a beam shown in figure 1. [07]
Take $K_B = 2\times10^5$ KN/m and $K_C = 1\times10^5$ KN/m

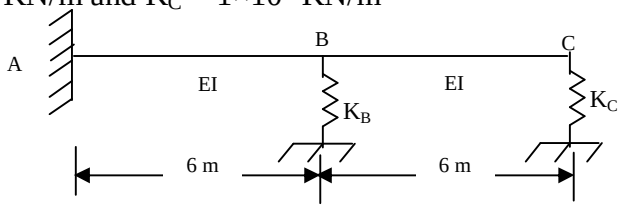

Fig:1

Q 2 (a) Analyse the beam as shown in figure 2 using the stiffness matrix member approach. [07]

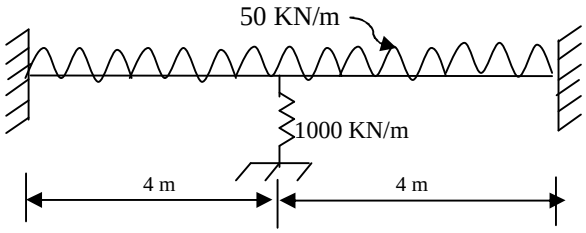

Fig:2

Q 2 (b) Derive and enlist the basic equations for the development of Flexibility Member Approach. [07]

OR

Q 2 (b) Derive and enlist the basic equations for the development of Stiffness Member Approach. [07]

Q 3 Calculate (a) the joint displacements of joints B and C and (b) Draw the shear force and bending moment diagram of the beam as shown in figure 4 using Flexibility Matrix member Approach. [14]

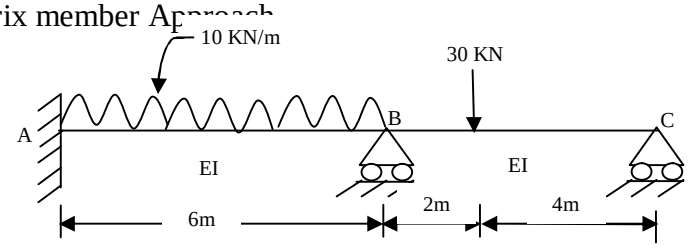

Fig:4

OR

Q 3 Obtain (a) the rearranged joint stiffness matrix and (b) draw the shear force and bending moment diagram of the beam as shown in figure 4 using the stiffness matrix member approach. [14]

Q 4 Calculate the (a) joint displacements and (b) draw the shear force and bending moment diagram of the plane frame as shown in figure 5 using Flexibility Matrix member Approach. [14]

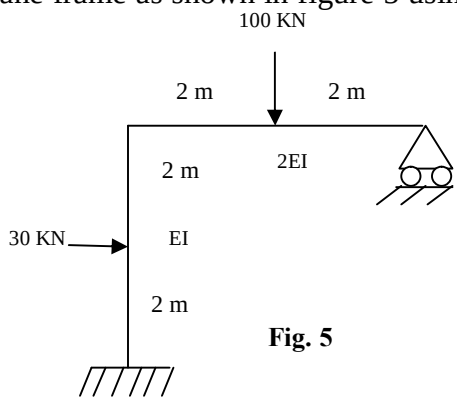

Fig. 5

OR

Q 4 Calculate the Action Transformation matrix, Assembled Flexibility and the support reactions matrix for the plane truss as shown in figure 6 [14]

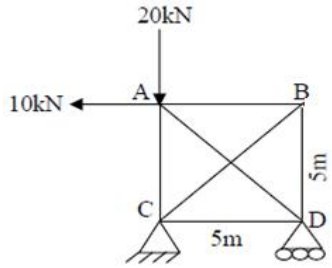

Fig. 6

Q 5 Analyse a beam shown in fig: 4 if support B sinks by 4 mm and temperature of AB is raised such that bottom fibers are at 30°C and top fibers are at 20°C. Omit the effect of external loads. Take $E=2\times10^{8}$ KN/m^2, I=0.001 m^4 and Ŭ=1.2×10^{-6} per °C. [14]

OR

Q 5 Obtain (a) the rearranged joint stiffness matrix and (b) the support reactions of the truss as shown in figure 7.Assume all members have same cross sectional area. [07]

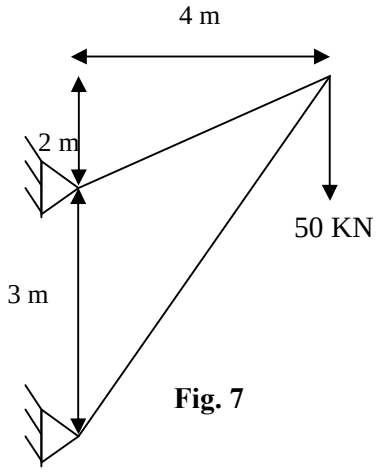

Fig. 7