Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech., Summer 2017-18 Examination

Semester: 1 **Date: 22-05-2018**

Subject Code: 03209101 **Time: 02:00PM to 04:30PM**

Subject Name: Matrix Methods of Structural Analysis **Total Marks: 60**

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 A) Obtain global member stiffness matrix for member AB of a rigid frame shown in the **Figure 1**. Take AE = 30 x 10^3 kN and EI = 60 x 10^3 kN.m^2. **(05)**

B) Explain the types of non-linearity. Also state the assumptions for a non-linear analysis. **(05)**

C) Obtain the combined joint load vector, A_C for the continuous beam as shown in the **Figure 2**. Assume EI is constant for all the members. **(05)**

Q.2 **Answer the following questions**. (Attempt any three) **(15)**

A) Derive stiffness matrix for a beam member and a plane frame member with proper notations and figures.

B) Briefly explain the concept of substructure analysis.

C) Find the global flexibility matrix for a truss as shown in the **Figure 3**.

D) Explain Newton Raphson's method of non-linear structural analysis.

Q.3 A) Using the concept of symmetry, determine the deformations produced in the beam as shown in the **Figure 4** below using stiffness member approach. **(07)**

B) Derive the relation $S_{MS} = R_T^T S_M R_T$ with usual notations. **(08)**

OR

B) Determine the member end actions for a plane frame as shown in the **Figure 5** using flexibility member approach. **(08)**

Q.4 A) Determine the reactions developed in the truss as shown in the **Figure 6**, if support A moves to left by 2mm and support B sinks down by 3mm. Take AE = 32000 kN. **(07)**

OR

A) Analyse the propped cantilever beam loaded as shown in **Figure 7** using flexibility member approach. **(07)**

B) Analyse the beam shown in the **Figure 8** below by stiffness member approach and plot SF and BM diagram. **(08)**

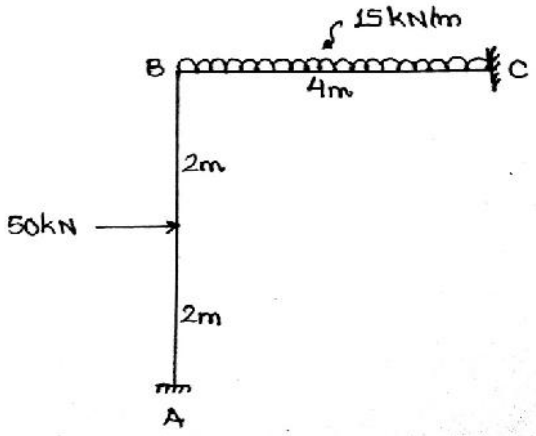

Figure 1

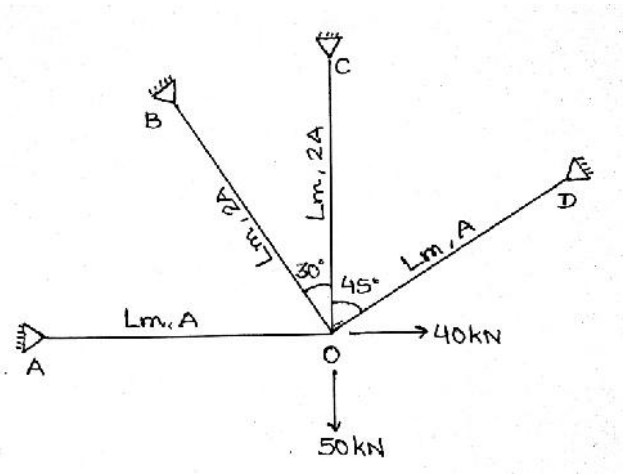

Figure 3

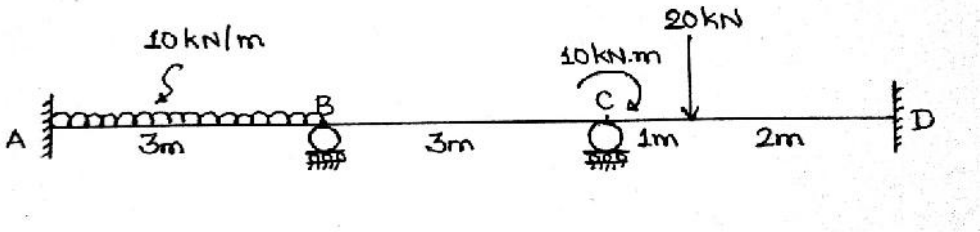

Figure 2

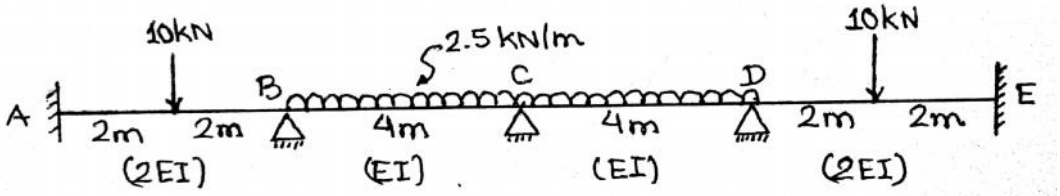

Figure 4

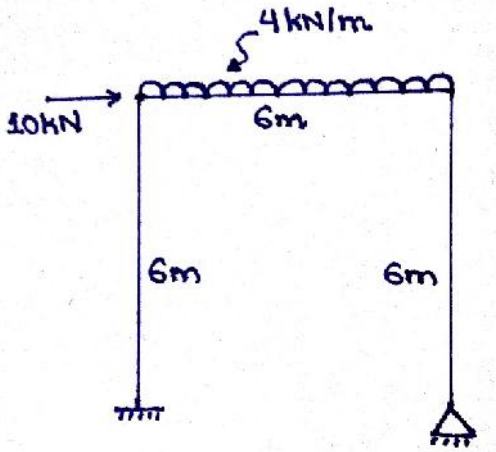

Figure 5

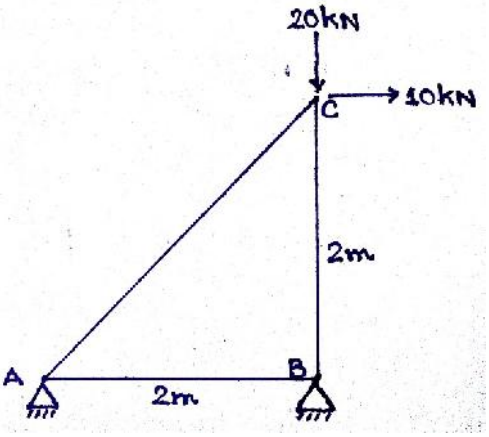

Figure 6

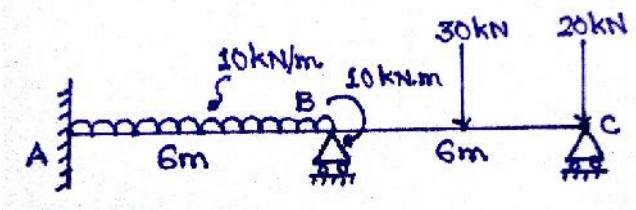

Figure 7

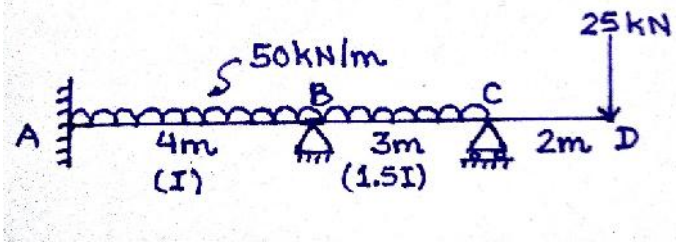

Figure 8