Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech., Winter 2018 – 19 Examination

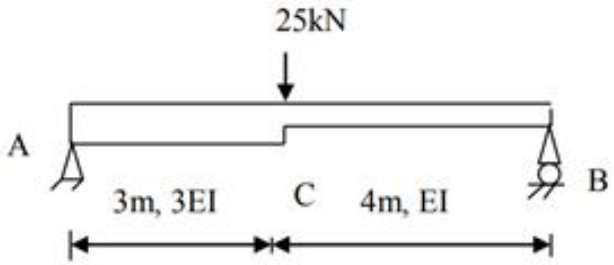
Semester: 1 **Date: 10/12/2018**
Subject Code: 03209101 **Time: 10:30 AM TO 1:00 PM**
Subject Name: Matrix Methods of Structural Analysis **Total Marks: 60**

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 Answer the following questions.

A) Derive the relationship between member stiffness matrix along member axis and structural axis. **(05)**

B) Formulate the rearranged stiffness matrix and combined load vector for the discontinuous beam shown below. **(05)**



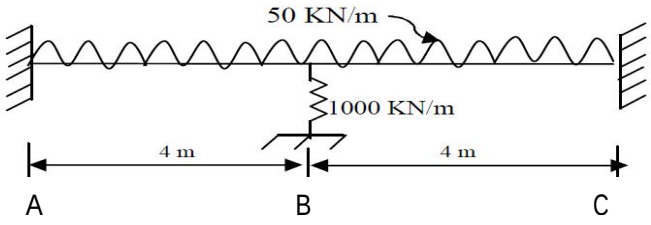
C) Find the member end action for the discontinuous beam shown in **Q.1 B)** and Plot the S.F and B.M diagram. **(05)**

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

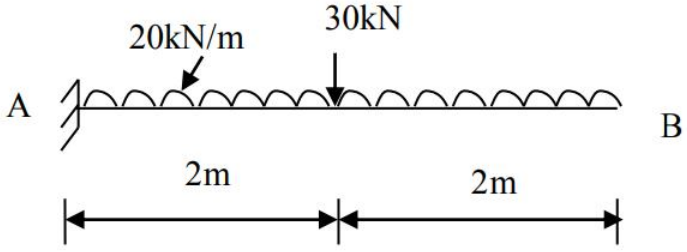
A) Explain term non linearity. Discuss the different non linearities in the structure. Also explain any one method for analyzing the same.

B) Explain sub-structure method of analysis giving examples. Also give advantages of the method.

C) Formulate Joint stiffness matrix for the beam shown below using the stiffness matrix member approach.

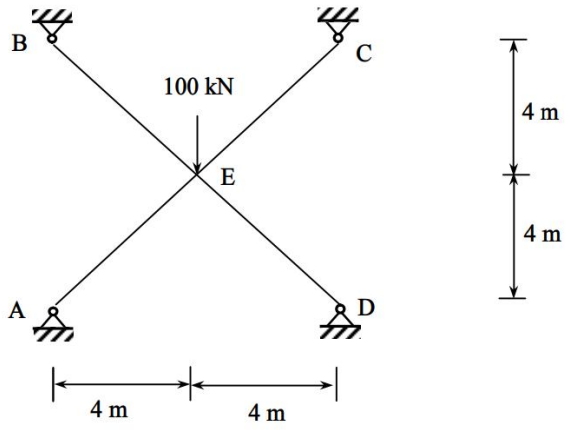


D) Formulate the flexibilty matrix for the cantilever beam shown below using flexibility member approach.



Q.3 Answer the following questions.

A) For the truss shown below, obtain rearranged joint stiffness matrix taking advantage of symmetry. **(07)**



B) Determine free joint displacements and support reactions for the truss shown in **Q.3 A)** using stiffness member approach. **(08)**

OR

B) For the following cases, neglecting loading, explain secondary effects, using Appropriate matrix method. **(08)**

(i) For **Fig. 1,** at B end there is roller support which sinks by 12mm.

(ii) For **Fig. 2,** temperature above beam is 40 ºC and 15 ºC below the beam.

Take $\alpha = 12 \times 10^{-6}$/ºC and depth of beam as 300mm.

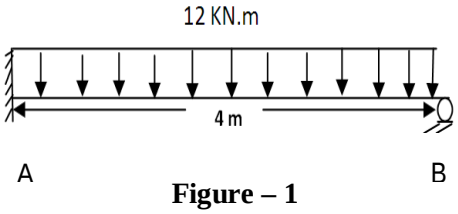


Figure – 1

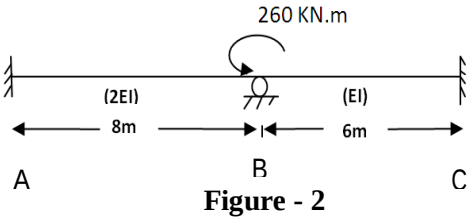
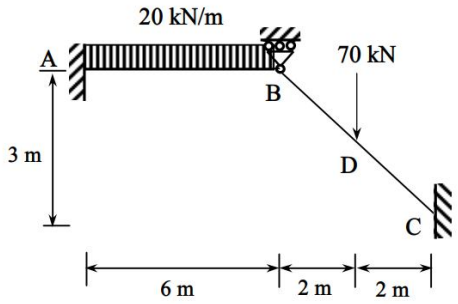


Figure - 2

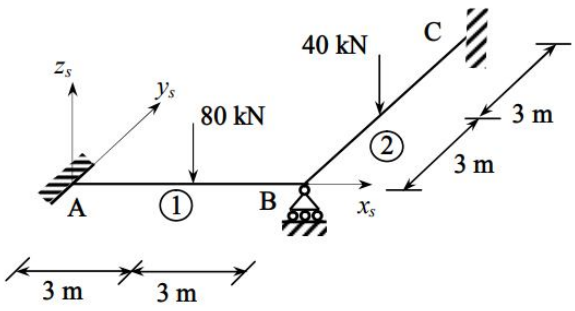
Q.4 Answer the following questions.

A) Construct the rearranged joint stiffness matrix and load vector for the plane frame shown below **(07)**



OR

A) Obtain the stiffness matrix and load vector for the grid shown below. **(07)**



B) For the structure shown in **Q.4 A)**, Plot the S.F.D (Select as per Q:4 (A) choice) **(08)**