Seat No: _____ Enrollment No: _____

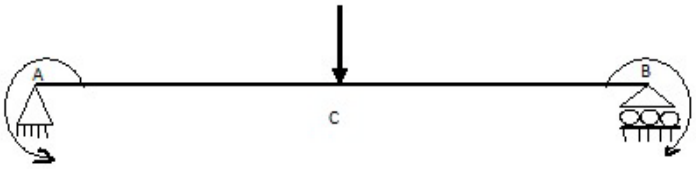
PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
M.Tech. Winter 2017 - 18 Examination

Semester: 1 **Date: 26/12/2017**
Subject Code: 03209101 **Time: 2:00pm to 4:30pm**
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.
5. Use of programmable calculator is allowed.

Q.1 (A) Formulate the stiffness member matrix for a beam element. **(05)**

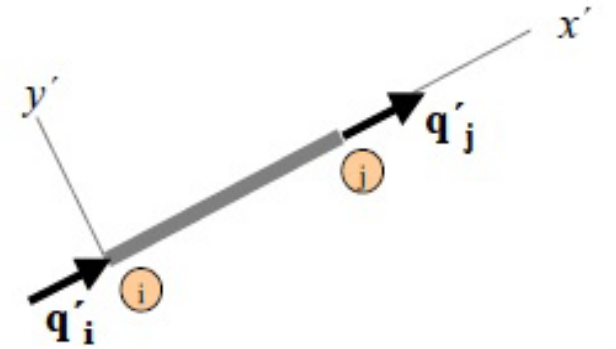
(B) Formulate the flexibility matrix for the beam shown below which is having **length L**, and point **C** is the centre of beam. **(05)**



(C) Write a brief note on Sub- Structure Analysis. **(05)**

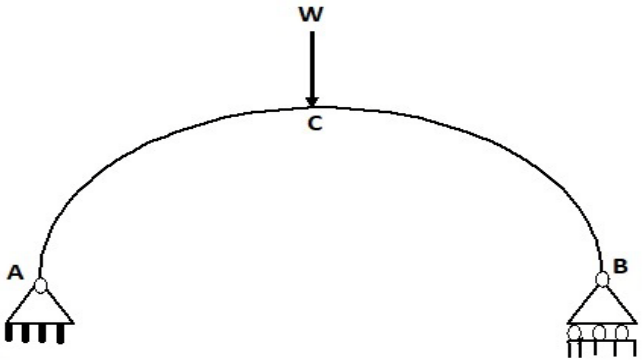
Q.2 Answer the following questions. (Attempt any three) (Each five mark) **(15)**

(A) Derive the stiffness matrix along the structural axis **[S_{ms}] or [K]** for truss member having length L as shown in figure below



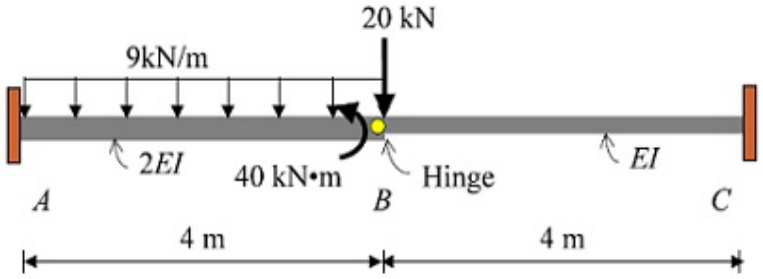
(B) Write a short note on secondary effects with suitable example for beam.

(C) Use the Castigliano's second theorem for finding out the horizontal reaction of two hinged parabolic arch of span length **L** and height **h** when it is loaded with **W kN** at its crown as Shown in figure.

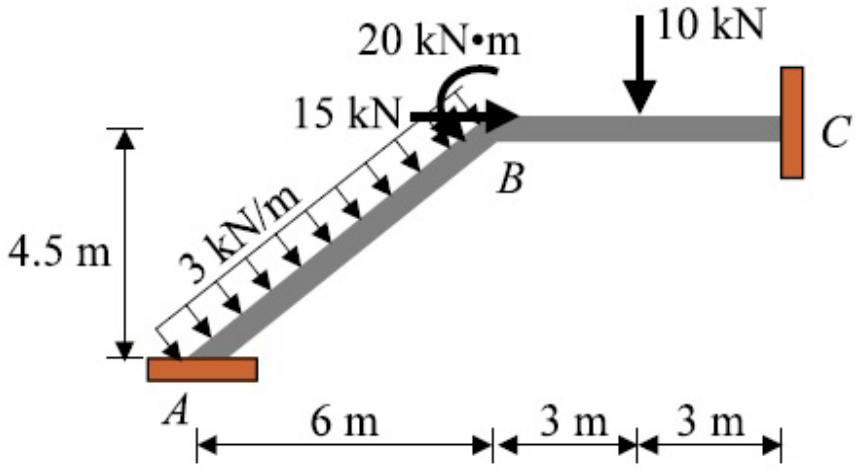


(D) Write a short note on shear deformation.

Q.3 (A) For the given beam shown in the figure, determine the reaction at all the supports, draw the quantitative shear force and bending moment diagram and also draw the deflected shape. Ignore the effect of hinge.**Take E = 200 Gpa I = 50x10$^{(-6)}$ m^4** **(07)**

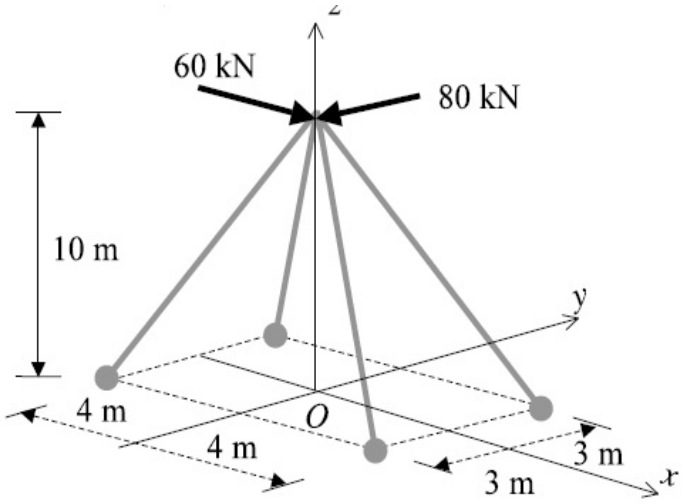


(B) For the beam shown in figure use the stiffness member method to determine the deflection and rotation at **B** and all the reactions at the supports. Draw the quantitative shear and bending moment diagrams. Take **E = 200 GPa, I = 60*10^6 mm^4** for each member **(08)**



OR

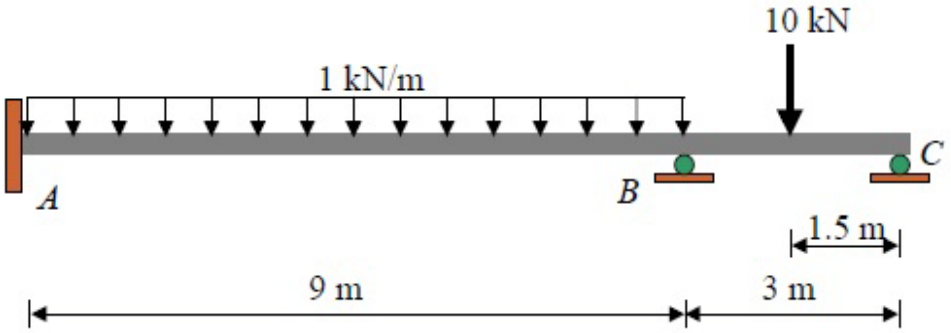
(B) For the truss shown below, find the member end action or end force for each member and also deflection at joint resisting external load, using stiffness member approach. **Take E = 200 GPa, A=1000 mm^2** **(08)**



Q.4(A) What is nonlinear analysis? Write down the different type of methods used to analyse non-linear member and also describe any two methods. **(07)**

OR

(A) For the beam shown below, using the stiffness member approach, determine the **deflection** and **rotation** at *B.* Determine all the reactions at the supports. Draw the **quantitative shear** and **bending moment diagrams.** **(07)**



(B) Determine the deflection at the joint **D,** if support **B** settles downward by an amount of **2.5mm**, Temperature in member **BD** is increased by **20^{o} C** . Take **$\alpha = 12x10^{-6}$ /^{o} C** and **AE = $8x10^{3}$ kN** **(08)**