GALGOTIAS UNIVERSITY

ADMISSION NUMBER													

School of Engineering

M.Tech Structural Engineering
Mid Term Examination - May 2024

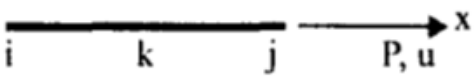
Duration : 90 Minutes
Max Marks : 50

Sem II - G1PC201T - Finite Element Analysis

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

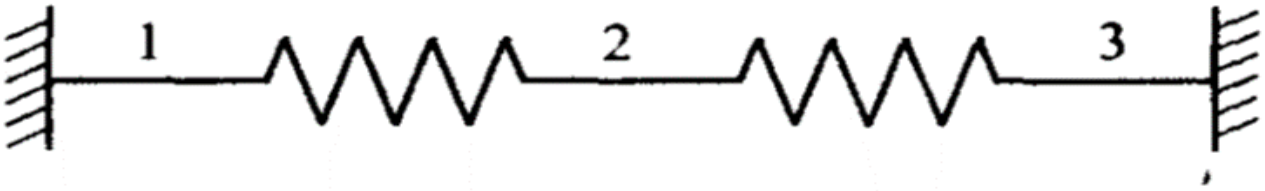
1)	Outline the importance of Rayleigh Ritz method.	K2	(2)
2)	Define bar element in finite element method.	K1	(3)
3)	Explain stiffness matrix and derive the same for truss element subjected to axial load and prove the following	K2	(4)
4)	Illustrate and Prove the stiffness matrix for beam element as given in the problem.	K2	(6)
5)	Identify various types of elements used in FEA and explain elaborately.	K3	(6)
6)	Examine the three noded truss element, subjected to axial load and prove the stiffness matrix given in the problem. Refer the following figure for function and diagram.	K3	(9)

$$u(x) = a_1 + a_2.x + a_3.x^2 = [\,1 \quad x \quad x^2\,] \begin{Bmatrix} a_1 \\ a_2 \\ a_3 \end{Bmatrix} = [f(x)]^T \{\,a\,\}$$



$$\mathbf{K} = \frac{AE}{3L}\begin{bmatrix} 7 & 1 & -8 \\ 1 & 7 & -8 \\ -8 & -8 & 16 \end{bmatrix}$$

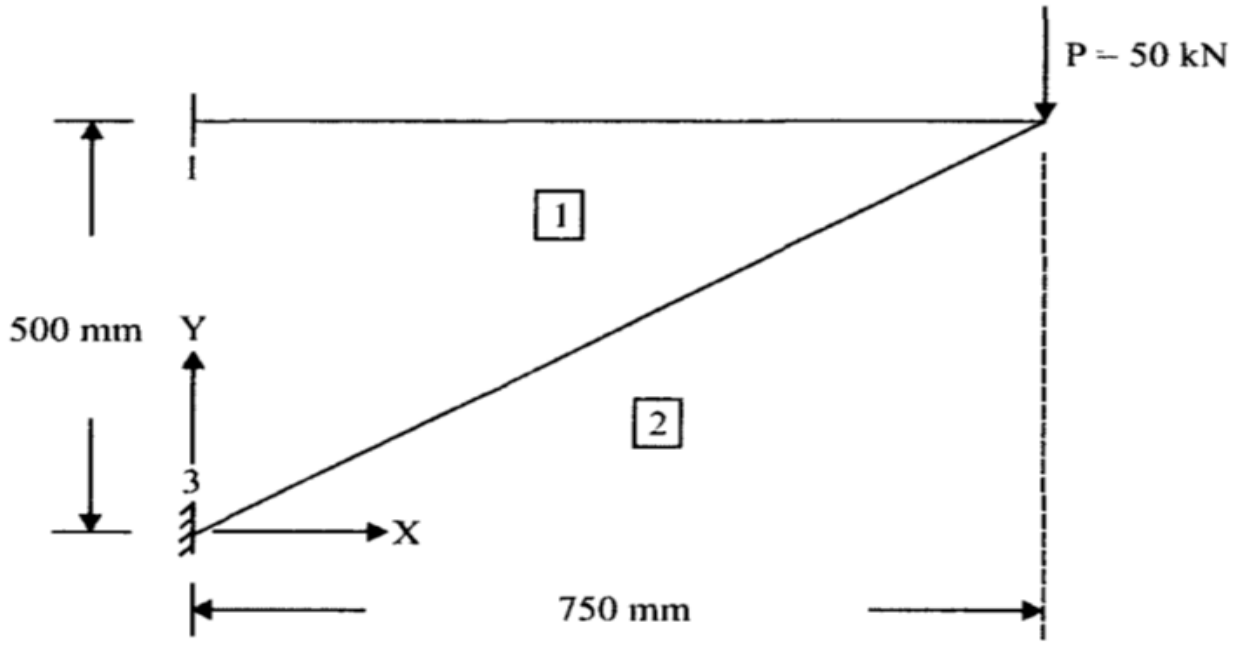
7) Using principle of minimum potential energy, find the displacement in the node 2. Refer the following figure: K4 (8)

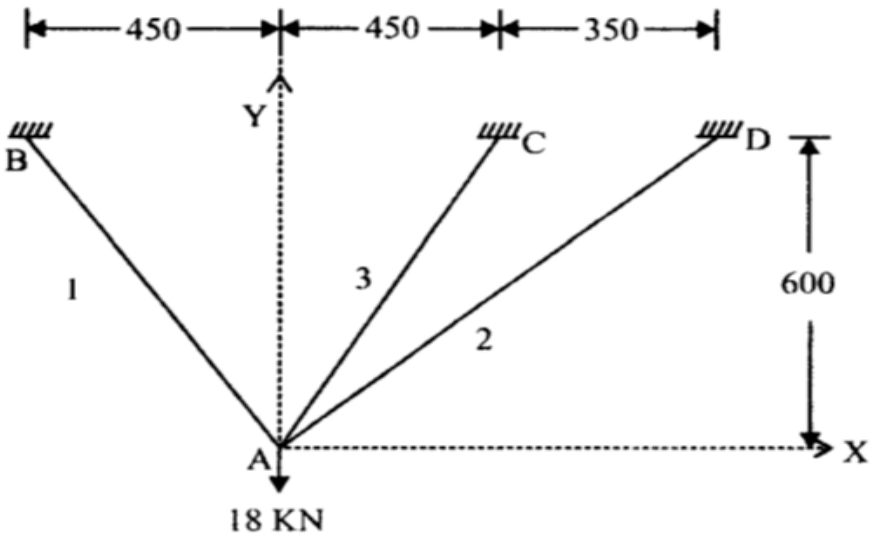


8) Determine the displacements at point 2. Assume that the points 1 and 3 are fixed. Refer the figure given an assume area A = 1000 Sq.mm along with G =200 Gpa. K4 (12)

OR

Determine the displacements at point2. Refer the figure shown below, assuming points 1 and 3 are fixed. Use E = 200 GPa and A = 1000 mm2 K4 (12)





$A = 250\ mm^2$; $E = 200\ GPa$