GALGOTIAS UNIVERSITY

ADMISSION NUMBER													

School of Engineering

M.Tech Structural Engineering
Semester End Examination - Jun 2024

Duration : 180 Minutes
Max Marks : 100

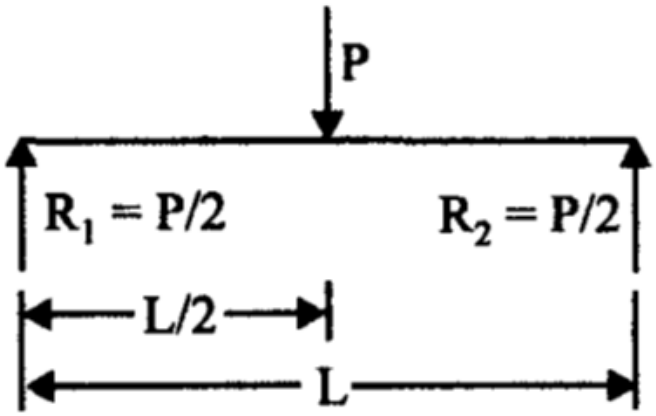
Sem II - G1PC201T - Finite Element Analysis

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) Name the applications of Rayleigh Ritz method. K1 (2)

2) Explain Plane strain rectangular element. K2 (4)

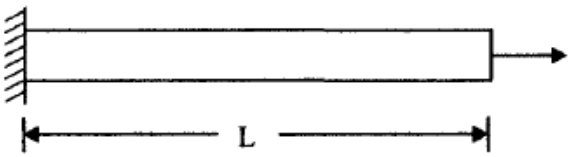
3) Derive the deflection at the centre of the simply supported beam subjected to Point load at the centre. Use Weighted Residual method. K2 (6)



4) Consider the bar shown in the figure. Prove the displacement given along with the figure K3 (9)

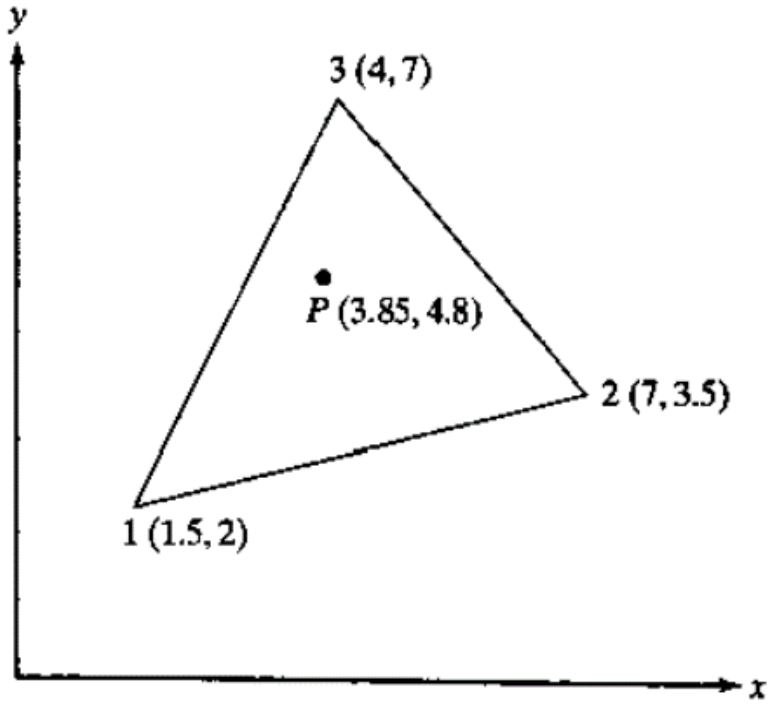
Consider the rod shown in Fig. where the strain at any point x is given as $\varepsilon_x = 1 + 2x^2$. Find the tip displacement

$$\delta = \frac{L + 2L^3}{3}$$

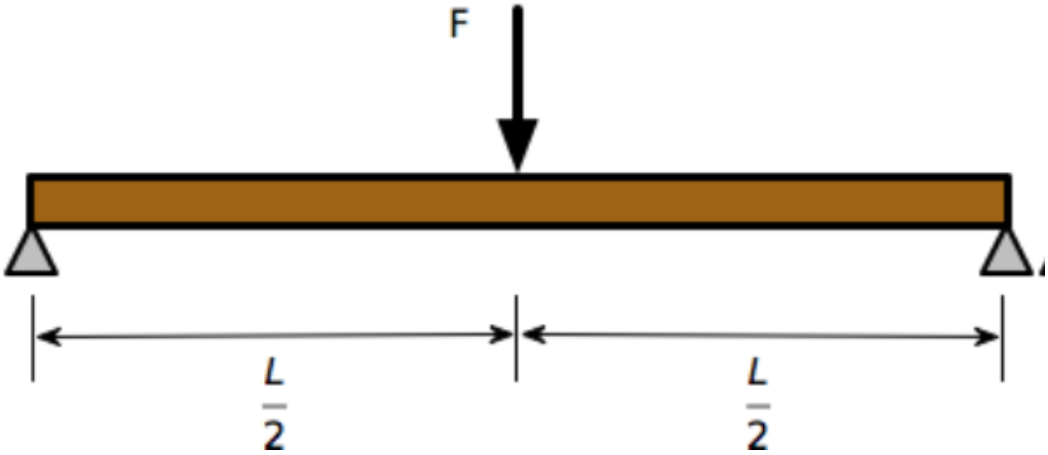


FIGURE

5) Evaluate the shape functions N1, N2 and N3 at the interior point P for the triangular element shown in following figure: K3 (9)



6) Find the deflection at the centre using Rayleigh Ritz method for the simply supported beam subjected to Concentrated load at the centre K5 (10)



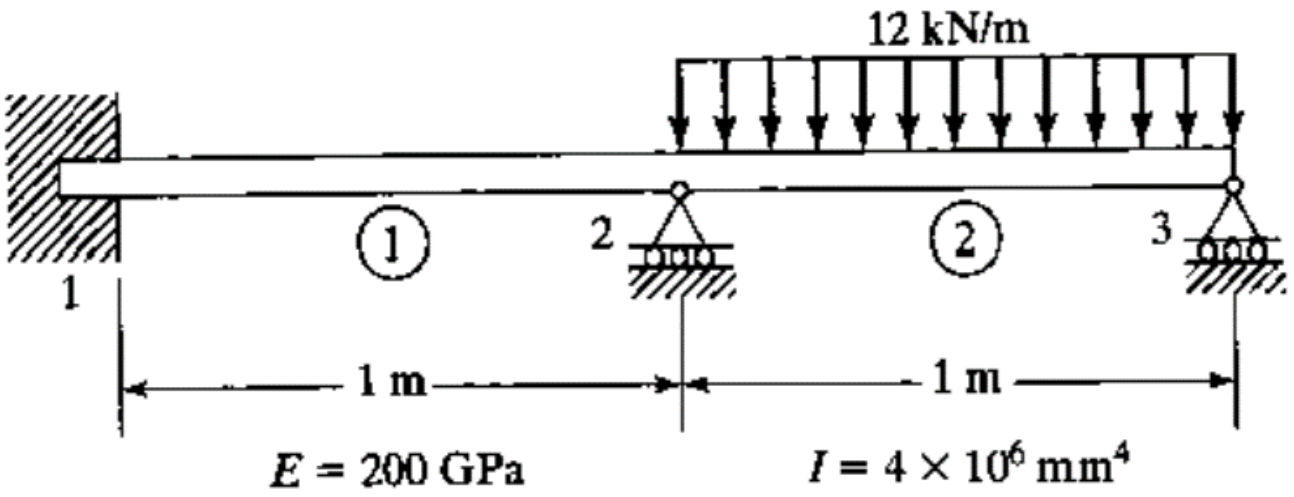
7) Derive the stiffness matrix for truss element and prove the following: K4 (12)

$$= \frac{EA}{L}\begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta & -\cos^2\theta & -\cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta & -\cos\theta\sin\theta & -\sin^2\theta \\ -\cos^2\theta & -\cos\theta\sin\theta & \cos^2\theta & \cos\theta\sin\theta \\ -\cos\theta\sin\theta & -\sin^2\theta & \cos\theta\sin\theta & \sin^2\theta \end{bmatrix}$$

$$[k] = \frac{EA}{L}\begin{bmatrix} l^2 & lm & -l^2 & -lm \\ lm & m^2 & -lm & -m^2 \\ -l^2 & -lm & l^2 & lm \\ -lm & -m^2 & lm & m^2 \end{bmatrix}$$

8) Determine the expression for maximum deflection of a cantilever beam subjected to uniformly distributed load w/m. Use Rayleigh Ritz method taking the deflection function as follows: $y = c_1\left[1 - Cos\frac{\pi x}{2l}\right]$ K5 (15)

9) For the beam and loading shown in following figure, determine the slopes at 2 and 3 . Also find the vertical deflection at the midpoint of the distributed load. K5 (15)



10) Calculate the displacement at node 2 of the tapered bar, taking Area at 1 as A1 and area at 2 as A2 K6 (18)