Portal Frame Structural Analysis Report

Step 1: Frame Input Data Collection

Nodes Collected: {1: (0.0, 0.0), 2: (0.0, 6.0), 3: (3.0, 9.0), 4: (6.0, 6.0), 5: (6.0, 0.0)}

Elements Collected: {1: {'nodes': (1, 2), 'E': 200000000.0, 'A': 0.075, 'I': 0.0004}, 2: {'nodes': (2, 3), 'E': 200000000.0, 'A': 0.075, 'I': 0.0004}, 3: {'nodes': (3, 4), 'E': 200000000.0, 'A': 0.075, 'I': 0.0004}, 4: {'nodes': (4, 5), 'E': 200000000.0, 'A': 0.075, 'I': 0.0004}}

Step 2: DOF Mapping

{1: [0, 1, 2, 3, 4, 5], 2: [3, 4, 5, 6, 7, 8], 3: [6, 7, 8, 9, 10, 11], 4: [9, 10, 11, 12, 13, 14]}

Step 3: Element Stiffness Matrices

Stiffness matrices calculated for each element.

Step 4: Global Stiffness Matrix Assembly

Global stiffness matrix assembled.

Step 5: Boundary Conditions

Constrained DOFs: [0, 1, 13]

Step 6: Fixed-End Moments

Element 1 FEM: [0. 0. 0. 0. 0. 0.]

Element 2 FEM: [0. 12.5 13.25825215 0. 12.5

-13.25825215]

Element 3 FEM: [0. 0. 0. 0. 0. 0.]

Element 4 FEM: [0. 0. 0. 0. 0. -0.]

Step 8: Member Forces

Element 1 Forces: [0. 0. 0. 0. 0. 0.]

Element 2 Forces: [0.   12.5   13.25825215   0.   12.5

-13.25825215]

Element 3 Forces: [0. 0. 0. 0. 0. 0.]

Element 4 Forces: [0. 0. 0. 0. 0. 0.]

Step 7: Node Displacements

[1, np.float64(0.0), np.float64(0.0), np.float64(0.0)]

[2, np.float64(0.0), np.float64(0.0), np.float64(0.0)]

[3, np.float64(0.0), np.float64(0.0), np.float64(0.0)]

[4, np.float64(0.0), np.float64(0.0), np.float64(0.0)]

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[5, np.float64(0.0), np.float64(0.0), np.float64(0.0)]

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Structure Visualization