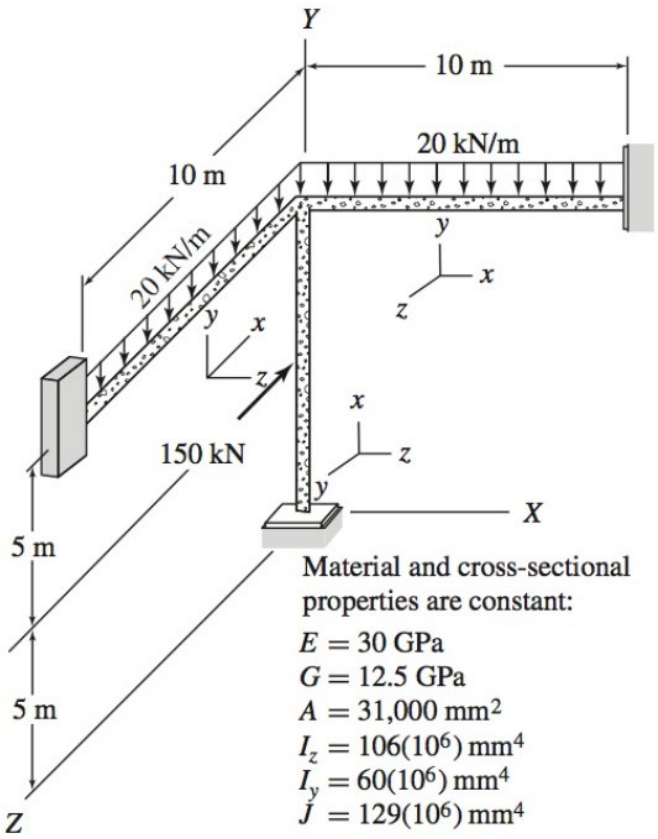
THE UNIVERSITY OF TOLEDO
1872

Department of Civil and Environmental Engineering

CIVE 4320/5320 – Computer-Aided Analysis of Structures

Tutorial 6 Example (Matrix Stiffness Method: 3D Frame)

Determine the joint displacements, member local end forces, and support reactions for the space frames shown, using the matrix stiffness method. Use **SAP2000** only.



Your submission must include the followings:

a) A joint displacements vector (i.e., a single column) which will list the displacements with the following order: X, Y, and Z displacements (in m using six decimal numbers), and X, Y, and Z rotations (in rad using six decimal numbers) for each node (i.e., six values per node). Use positive values for the positive global coordinate system directions.

b) A member local end forces vector (i.e., a single column) which will list the forces with the following order: x, y, and z forces (in kN using three decimal numbers), and x, y, and z moments (in kNm using three decimal numbers) for each node (i.e., twelve values per member). Use positive values for the positive local coordinate system directions.

c) A support reaction vector (i.e., a single column) which will list the reactions with the following order: X, Y, and Z forces (in kN using three decimal numbers), and X, Y, and Z moments (in kNm using three decimal numbers) for each node (i.e., six values per node). Use positive values for the positive global coordinate system directions.

d) Print the axial force, shear force and moment diagrams with peak values shown on the diagrams. Plot positive values above the horizontal axis.

e) Print the deflected shape, superimposed on the undeflected shape.

f) Neatly show your hand calculations to check the equilibrium conditions.