**CE 592: Plastic Design Exam No. 2 Due: April 11, 2014**

**Part 1.** Implement a computer method to numerically calculate the axial force-axial strain-bending moment-curvature (P--M-) relationship of a singly or doubly symmetric cross-section made of steel. More specifically, your method should work for I-shaped and T-shaped cross-sections.

Report the M- relationships for P = 0, 0.2, 0.4, and 0.6 PY, where PY is the yield load of the cross-section for the following cross-sections. Also develop the associated P-M interaction diagrams for the sections.

W 24x76 made from ASTM A992

WT 12x38 (Tee section) made from ASTM A992 steel.

**Part 2.** Model the structure shown below in ABAQUS, and determine the complete load-displacement response up to collapse. Note the axial force acting on the beam-column.



Confirm the load values corresponding to the occurrence of plastic hinges using the event-to-event analysis discussed in class (no need to worry about the displacements or hinge rotations).

Use the plastic mechanism method to calculate the plastic limit load for the structure. Compare it with the structure load capacity from ABAQUS.

**Part 3.** Model the structure shown below in ABAQUS, and determine the complete load-displacement response up to collapse. Note the axial force acting on the beam-column.



Confirm the load values corresponding to the occurrence of plastic hinges using the event-to-event analysis discussed in class (no need to worry about the displacements or hinge rotations).

Use the plastic mechanism method to calculate the plastic limit load for the structure. Compare it with the structure load capacity from ABAQUS.

Did you encounter some issues with this part? Is there a problem with ABAQUS? Or, were you able to match your hand calculations with ABAQUS? What did you conclude from this analysis?