CE 525 Fall 2024 HW#1

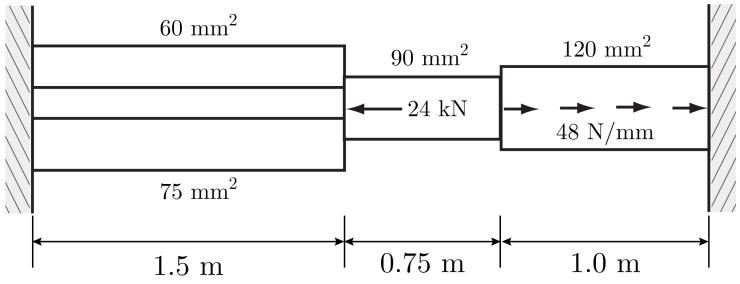
Due Thursday, September 12, by 5:00pm ET

1. For the uniaxial structure shown below determine joint displacements, member end forces along with axial force diagram, and external reactions using:

a. (5 pts) Hand calculations

b. (5 pts) SAP2000

c. (5 pts) MATLAB (or programming language of choice)

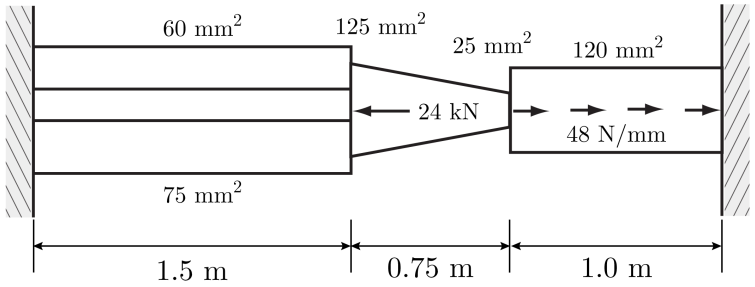


E = 20 GPa for all members

2. For the modified uniaxial structure that now contains a tapered member, determine joint displacements and external reactions using MATLAB by:

a. (5 pts) Deriving and implementing the exact element stiffness matrix [k]

b. (5 pts) Discretizing the tapered member into a series of prismatic elements using the average cross-sectional area within a segment to obtain 99% accuracy. Plot the exact versus approximated displacements for n = 1, 2, … segments.



E = 20 GPa for all members