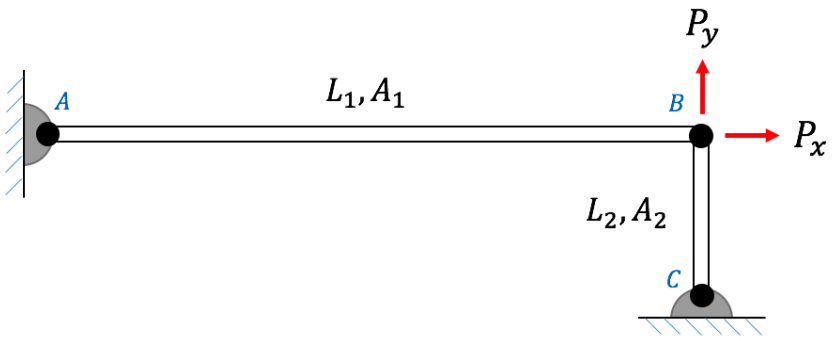
ME-621 Advanced Finite Element Method

Assignment 1

Due Date/Time: Wed Jan 31, 2024 @ 10:00am

Problem 1: A system of two aluminum bars of the same material is shown in the following figure. The system is subjected to two external loads, P_x and P_y, at joint *B*. *A* and *C* are connected to pinned supports.



$$E = 70GPa, L_1 = 3m, L_2 = 0.5m, A_1 = A_2 = 0.001m^2$$

I. Obtain the external loads P_x and P_y as a function of horizontal and vertical displacements at point *B*.
II. Determine the displacements in both *x* and *y* directions for 1000 load increments of +5 N for both P_x and P_y (from zero).
III. Find the displacement of point B after the final increment.

Write a MATLAB code with a convergence error of 10^{-5} to numerically solve the problem. Use a combination of (a) Euler and N-R, and (b) Euler and modified N-R. Also plot the resultant force versus the resultant displacement.

Use the Green strain measure:

$$E = \frac{l^2 - L^2}{2L^2}$$

in which *L* and *l* are the initial and current length of the bar, respectively.

You can make reasonable assumptions, if needed, and state your assumptions in your solution.