ME 323: Mechanics of Materials ***Homework Set H07***

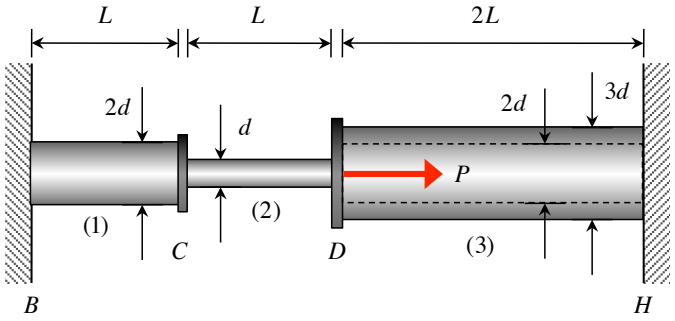
Summer 2024 ***Assigned/Due: June 18/June 20***

PART A – 10 points

A three-segment rod is constructed as shown below. Segments (1) and (2) have a length of L, whereas segment (3) has a length of $2L$. Segments (1) and (2) have solid, circular cross sections with diameters of $2d$ and d, respectively, whereas segment (3) is a tube with outer and inner diameters of $3d$ and $2d$, respectively. Segments (1) and (2) are joined by a rigid connecter at C, and segments (2) and (3) are joined by a rigid connector at D. Ends B and H of the rod are fixed to rigid walls. All three segments are made of the same material, with E being the Young's modulus of the material. A force P acts on connector D.

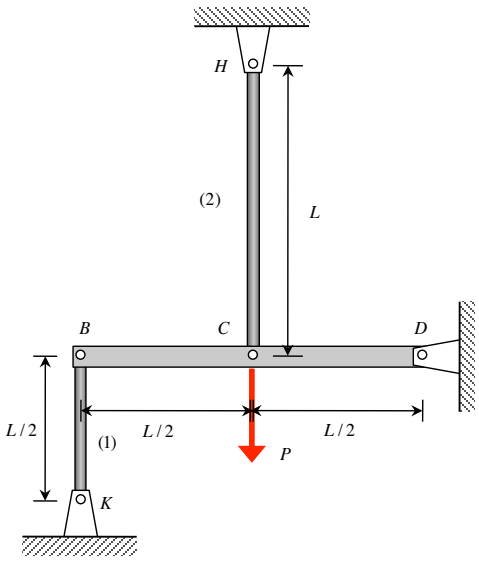
a) Determine the stresses in each of the three segments of the rod.

b) Determine the displacements of connectors C and D.

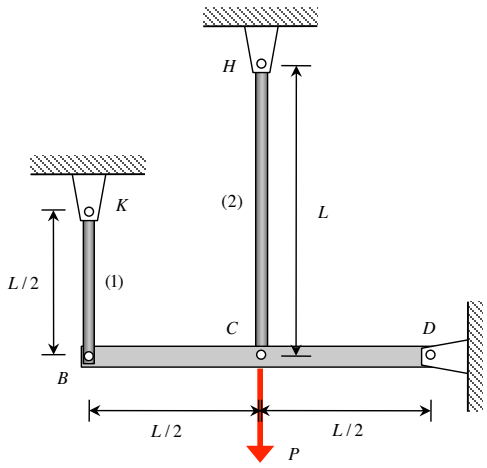


PART B – 4 points

Consider the two structures below, (i) and (ii). In each case, let F_1 and F_2 represent the axial loads carried by members (1) and (2), with the sign conventions that $F_i > 0$ and $e_i > 0$ for the ith member being in tension. For each structure, write down the *compatibility equation* relating the elongations e_1 and e_2.



Structure (i)



Structure (ii)