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1) Determine mass and centroidal mass moment of inertia for an aluminum bar that is 4 cm wide, 25 cm long and 2 cm thick. Then create a Working Model (WM) link and adjust the mass in the "Properties" window to represent the actual link. Working Model assumes that all links are planar and are one unit thick. Validate your approach by repeating for an aluminum circular disk with 15 cm diameter and 2 cm thickness. Use units of [kg] for mass and [$kg.cm^2$] for mass moment of inertia.

	4 x 25 x 2 cm bar	15 cm OD x 2 cm disk
actual density	______________________	______________________
mass	______________________	______________________
centroidal J	______________________	______________________
WM mass	______________________	______________________
WM centroidal J	______________________	______________________
WM density	______________________	______________________

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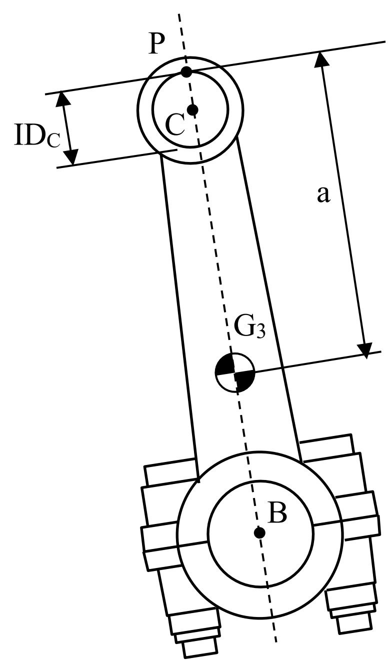
2) A connecting rod 3 from an air compressor was weighed and measured as shown below. The connecting rod was balanced on a straight edge to find its centroid location G_3. It was then suspended by the inner surface of the wrist pin at point P and allowed to swing freely with small angle motion. Twenty periods of oscillation were measured. These measurements were repeated ten times.

m_3 = 0.462 lbm L = BC = 4.33 inch a = 3.642 inch ID_C = 0.707 inch

20 τ = 13.69 13.67 13.64 13.67 13.66 13.76 13.74 13.73 13.79 13.67 sec

Determine time period τ, standard deviation σ_τ and centroidal mass moment of inertia J_{G3}.

τ ___________ σ_τ ___________ $100\ \sigma_\tau / \tau$ ___________ J_{G3} __________________



3) Determine BG_3 and CG_3. Then use the two-mass equivalent link model to find lumped masses m_{3B} and m_{3C} and the approximate lumped mass moment of inertia J_{APP}.

BG_3 __________ CG_3 __________ m_{3B} ___________ m_{3C} ___________ J_{APP} ___________

4) Use "polygeom" boundary summations to approximate mass, centroid location and centroidal polar mass moment of inertia for the connecting rod assuming it is made of 0.75 inch thick flat aluminum plate. Outlines for the connecting rod and holes are available in "h10_conn_rod_CCW.txt", "h10_holeB_CCW.txt" and "h10_holeC_CCW.txt" on our class web page. Note that all three outlines were digitized CCW. Provide a plot of your outlines with a small red cross at the centroid location and attach hard copy of your code.

m_3 ________________ BG_3 ________________ $J_{BOUNDARY}$ _________________

5) Compare your experimental measurements, lumped mass approximations and flat plate boundary approximations for mass, centroid location and mass moment of inertia.