**ME 581 – C03** **Name** _____

1) Use the full size image of link 3 for the web cutter provided below to calculate mass, centroid location and centroidal polar mass moment of inertia using classical geometric methods. Provide $\{s_3\}'^{G}$ relative to the coordinate frame used for C01. The link is made of 1 cm thick aluminum. **Show your work and units.**

$m_3$ _____ $\{s_3\}'^{G}$ $\{$ _____ , _____ $\}^T$ $J_{G3}$' _____

2) Use boundary summations to approximate mass, centroid location and centroidal polar mass moment of inertia for each link in the web cutter. Scaled outlines for all three links are available in "wc_link%.txt" on our class web page. The outlines have been aligned with coordinate frames used for C01 and traced CCW. Links are made of 1 cm thick aluminum.

| Link | 2 | 3 | 4 |
|---|---|---|---|
| Mass m | | | |
| Centroid $\{s_i\}'^{G}$ | $\{$ , $\}^T$ | $\{$ , $\}^T$ | $\{$ , $\}^T$ |
| Polar moment $J_{Gi}$' | | | |

3) How do your geometric calculations compare to boundary integral results?

4) Relocate local coordinate frames to the centroids of the links and repeat the plots requested for C02. Angular velocities and angular accelerations of the links should remain the same. You need not repeat any work for speed of the web.

ESTIMATED GLOBAL POSE OF COORDINATE FRAMES

| Link | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Origin $\{r_i\}$ | $\{0, 0\}^T$ | $\{$ , $\}^T$ | $\{$ , $\}^T$ | $\{$ , $\}^T$ |
| Angle $\phi_i$ | 0 deg | 30 deg | deg | deg |

CONSTANT LOCAL BODY-FIXED LOCATIONS OF SPECIFIC POINTS

| | $\{s_1\}'$ | $\{s_2\}'$ | $\{s_3\}'$ | $\{s_4\}'$ |
|---|---|---|---|---|
| A | $\{$ , $\}^T$ | $\{$ , $\}^T$ | | |
| B | | $\{$ , $\}^T$ | $\{$ , $\}^T$ | |
| C | | | $\{$ , $\}^T$ | $\{$ , $\}^T$ |
| D | $\{$ , $\}^T$ | | | $\{$ , $\}^T$ |
| P | | | $\{$ , $\}^T$ | |
| Q | | | | $\{$ , $\}^T$ |

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1ink 3 - full size