IAT106: Spatial Thinking and Communicating

Lab 7: Four Bar Linkages

In this lab you will complete exercises on four bar linkages. The lab is divided into three parts.

For Part I, you will use an online four bar simulator to design three linkages, each tracing a different kind of path. For Part II, you will make digital model of one of the four bar linkages from Part I. For Part III you will write a report.

Part I: Four bar linkage simulation

Using the simulator at https://dynref.engr.illinois.edu/aml.html. When you open this link, scroll all the way down to "Full Linkage Model". Create three linkages as follows:

Linkage 1: The path traced by the linkage is close to circular. This is likely to be a crank-crank mechanism (You already have finished it as part of the pre-lab).

Linkage 2: This is to be a crank-rocker linkage with the path traced by the linkage has a significant part that is close to a straight line.

Linkage 3: The path traced by the linkage is a figure eight (8, ∞ or any other crazy 8).

Note that the simulator traces the path of a point (P) that is located with respect to the coupler link! You can think of the coupler link as a triangle, with the base being the actual link and the trace point the apex of the triangle.

Record the parameters of the simulation. You will use these parameters in the next part of the lab. Make a screen shot of each of the simulations that includes the parameter values and a trace of the path in red and upload them to Canvas before the start of the next lab. As usual include your name and lab section in the file name as follows: <StudentName_labsection>_Image#.jpg (Eg: JohnDill_E101 _line.jpg and JohnDill_E101 _figure8.jpg)
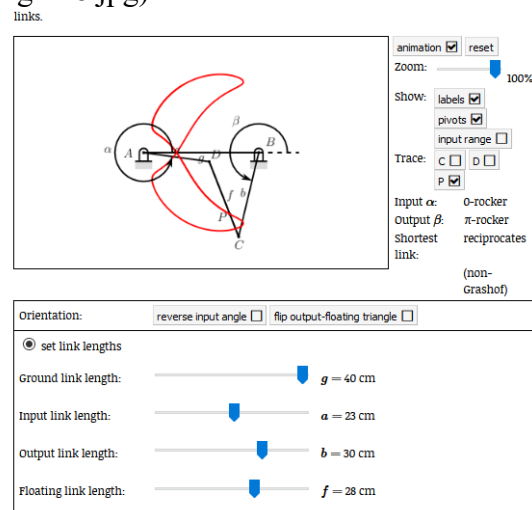
Part II: Make a digital model of a four-bar linkage

This part is to be done individually again.

Please select one of the link-combination from Part I.

Create an OnShape parts for the ground, input, output, coupler linkage-bars and pins to connects the linkages.

Make an assembly that combines the above four linkages into a working four bar mechanism. The *imaginary path* followed by the assembly can be any one of the above explored paths (circle, line or figure 8).

Part III: Lab 7 Report

This part is to be done individually.

Write a one-page report with the following:

- Hand sketch your OnShape linkage. Use one view only with view direction perpendicular to the plane of the linkage.
- Label each part according to Grashof's Criterion (s, l, p & q). Dimension the links; on each dimension put its label and actual length.
- Show Grashof's Criterion for your linkage.
- Describe whether your linkage is crank-crank, crank-rocker or rocker-rocker.

Name the file *Lab6_Report_<studentID>.pdf* .

Item	Due	Individual or Team	Criteria	Activity Mark	Part Mark	Total
Four bar linkage simulation (circle line, figure 8	before next lab	individual			**30**	
			5 points for each correct path	10		
OnShape four bar linkage	before next lab	individual			**60**	
			parts	30		
			mates	30		
Reflection on physical mechanisms	before next lab	individual			**10**	
			correct labeling and mechanism type	5		
			Grashof's criterion	5		
TOTAL						**100**