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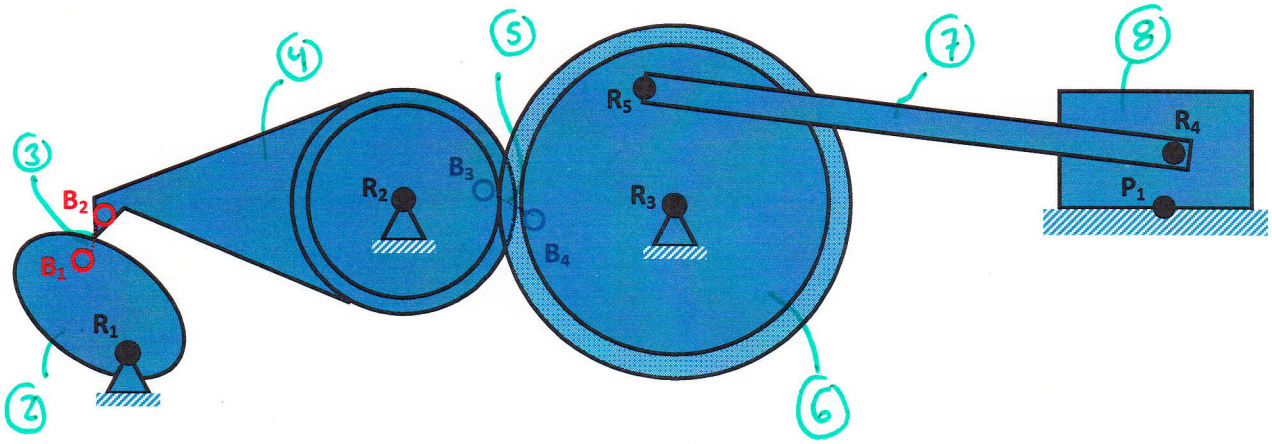
Signature: _____

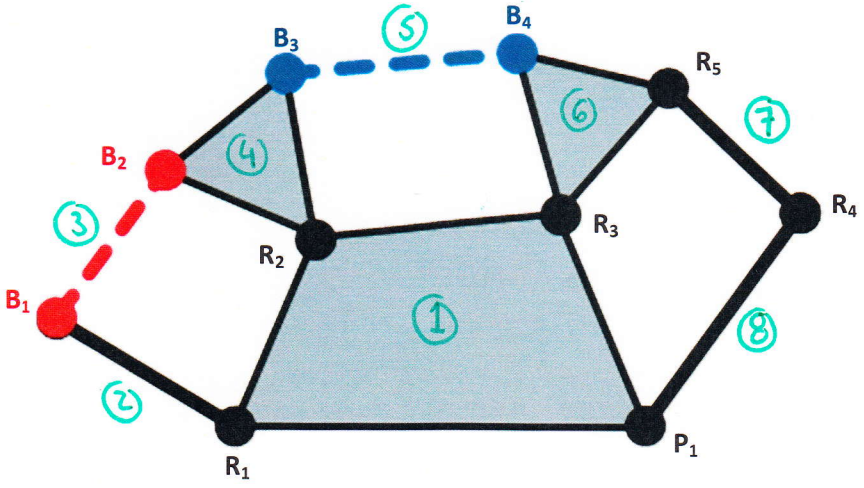
Print Name: **Solution**

Exam Date: _____

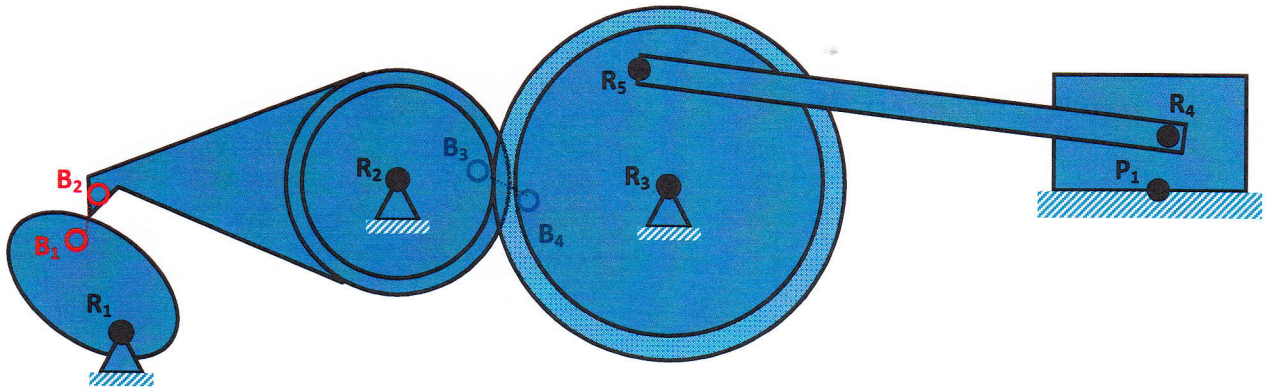
PROBLEM 1 (40 pts): Shown below is a simple mechanism that will generate oscillating horizontal sliding contact as a cam on the far left rotates.

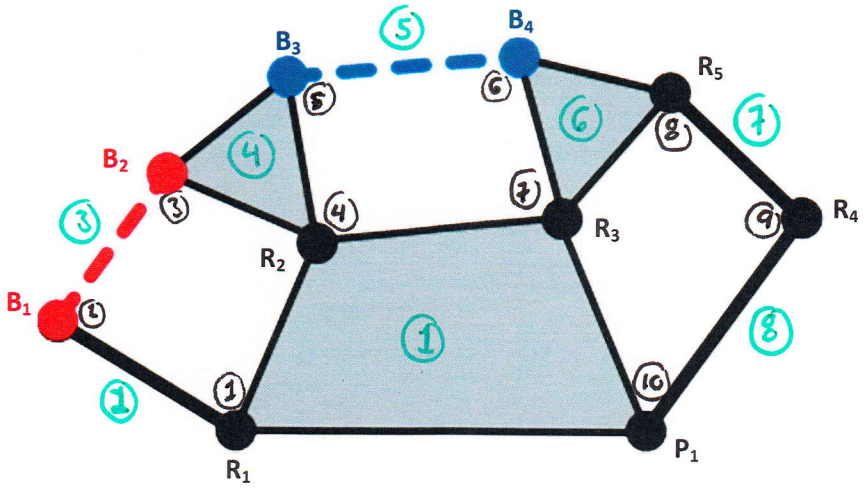
1a) Directly below the figure of the mechanism, draw the isomer that represents this mechanism. Make sure to label all links and joints. When labeling joints be sure to use the convention of B for Base Points, R for Revolute joints, and P for prismatic joints.





1b. Determine the number of degrees of freedom for this mechanism.



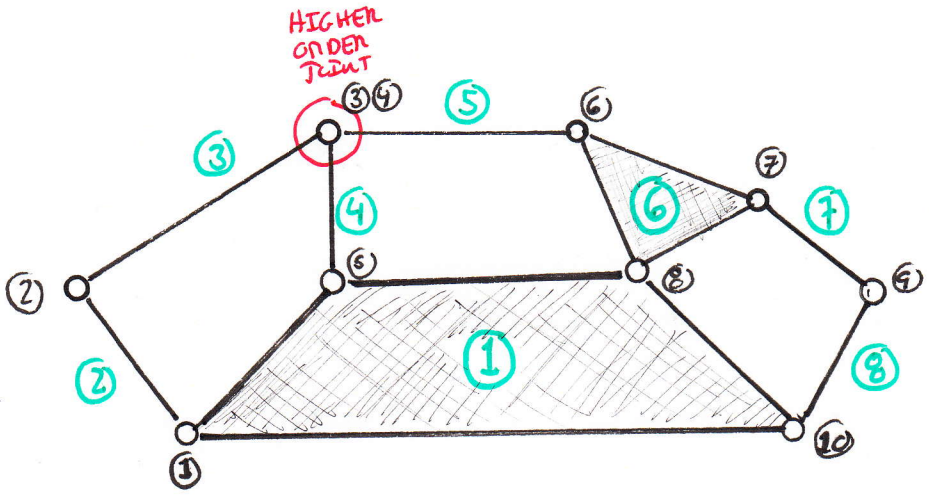


GRUEBLER'S EQUATION: $M = 3(L-1) - 2J$

$= 3(8-1) - 2(10) = \boxed{1}$

1c. Partially shrink one of the higher order links in the isomer found in (1a) and draw it below. Calculate the new number of degrees of freedom.

PARTIALLY SHRINKING LINK 4



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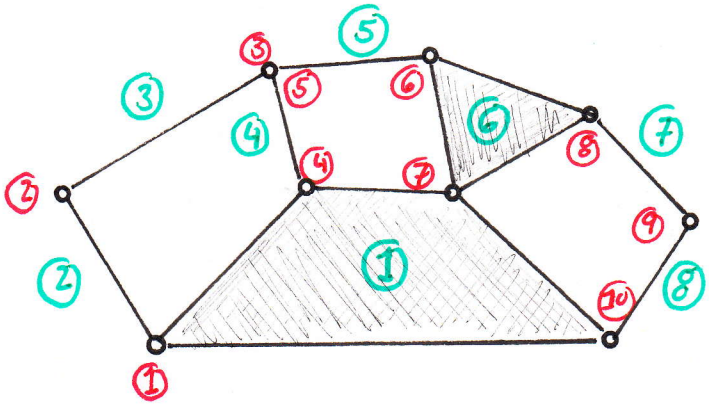
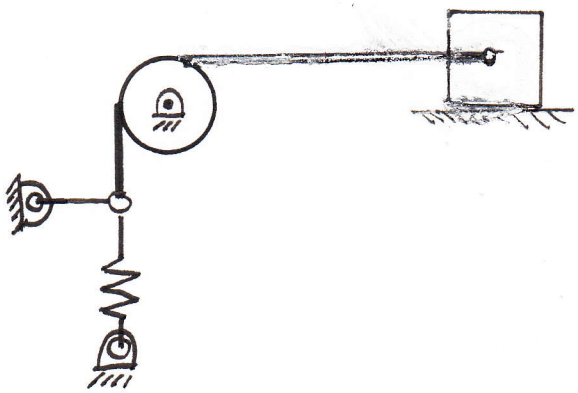
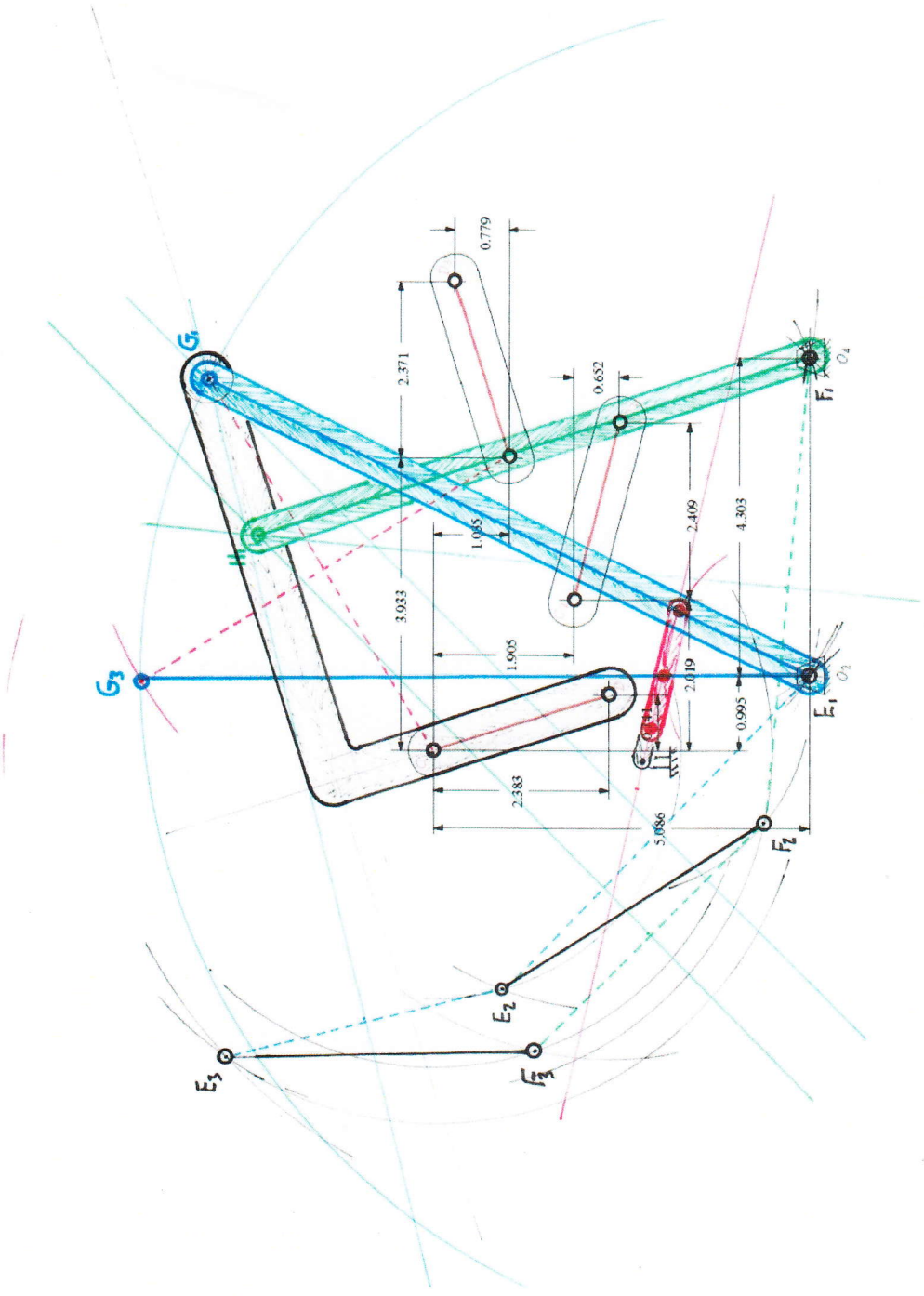
1d. Using either the isomer in (1a) **or** (1c), synthesize a mechanism that produces horizontal sliding contact that is different from the original mechanism in the problem statement. Include at least two elements that are not revolute or prismatic joints.



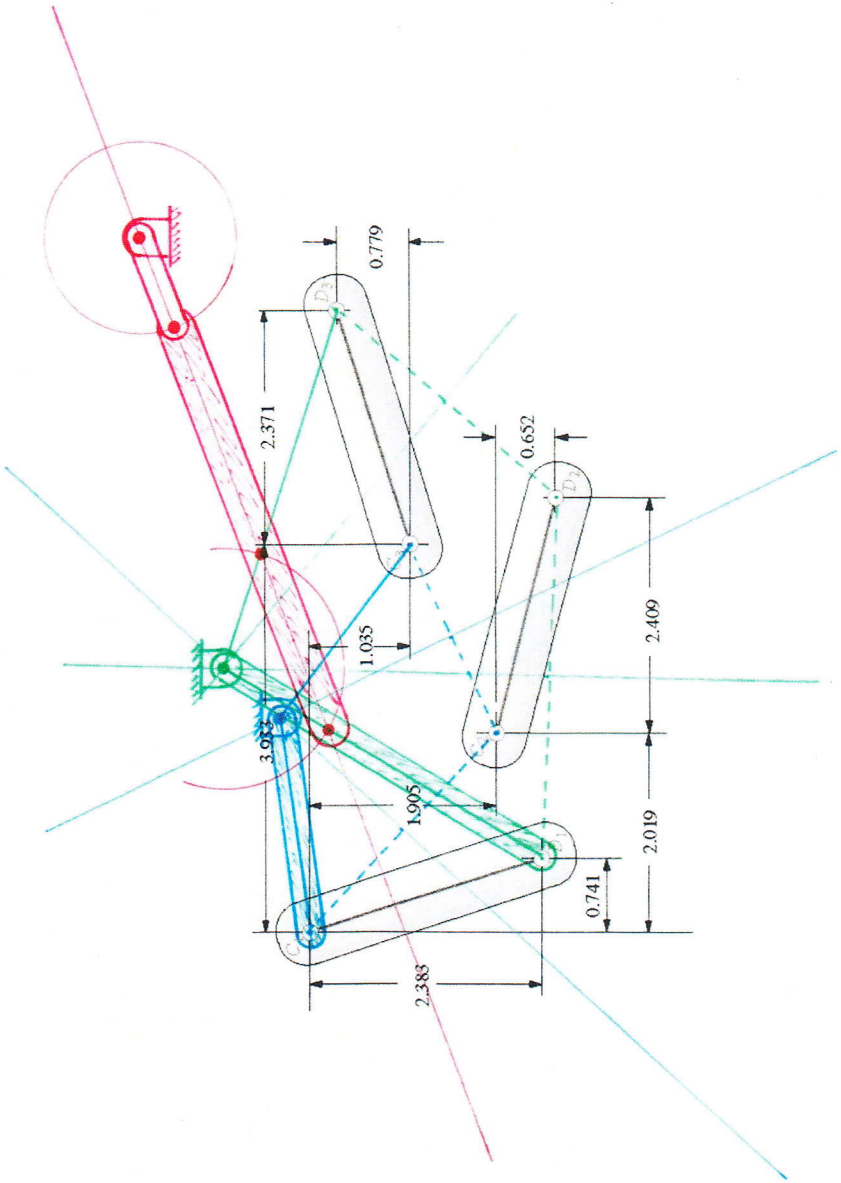
LETTING LINKS 5, 6 & 7 REPRESENT A PULLEY AND LINKS 2 & 3 REPRESENT A SPRING



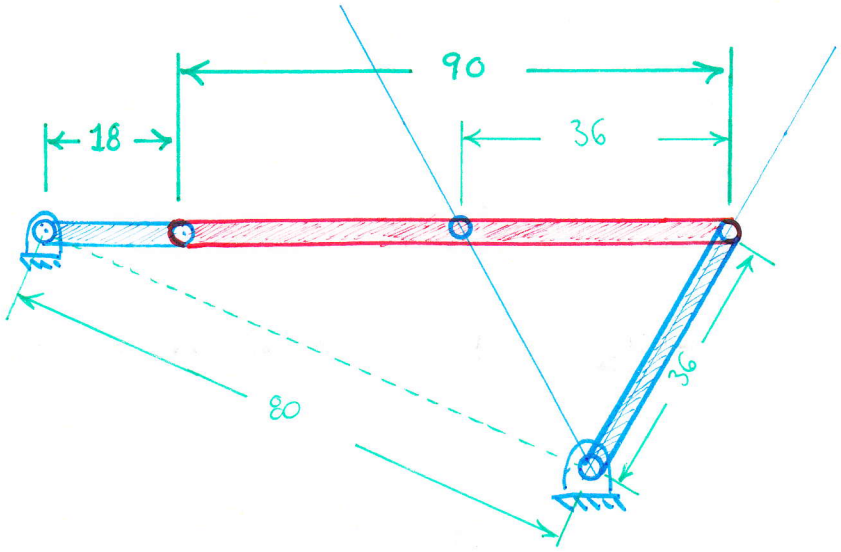
PROBLEM 2 (40 pts): Using graphical techniques, design a four bar mechanism to give the three positions of coupler motion below using the fixed pivots O_2 and O_4. Add a drive dyad to the final mechanism.



IF THE PIVOTS / FIXED GROUNDS ARE IGNORED.



PROBLEM 3 (20 pts): Using the graphical technique, design a four bar Grashof Crank-rocker for 60 degrees of output rocker motion with no quick return. VERIFY THAT THE MECHANISM IS A GRASHOF MECHANISM. Make sure that the crank link will rotate 360°.



THE GRASHOF CONDITION STATES

$L+S \leq M+N$

$18+90 \leq 80+36$

$108 \leq 116$ ✓

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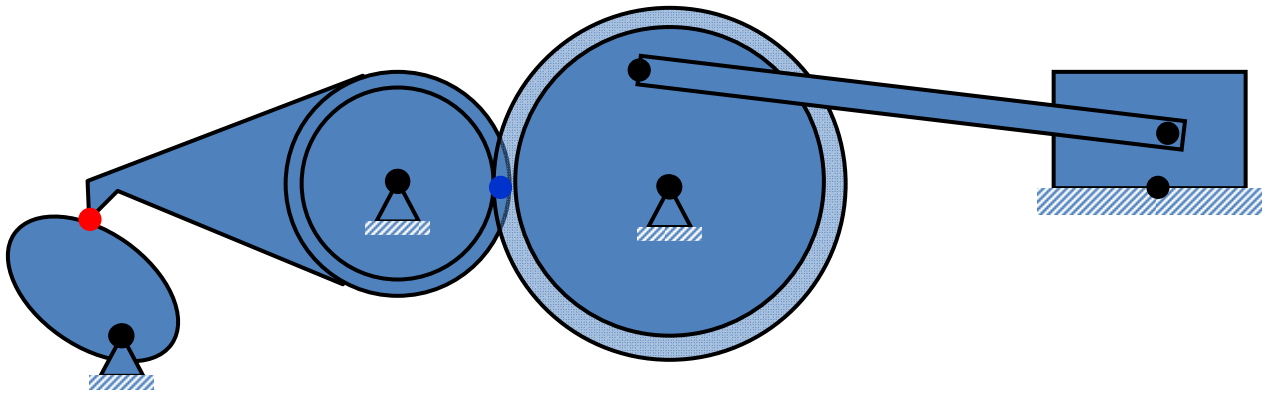

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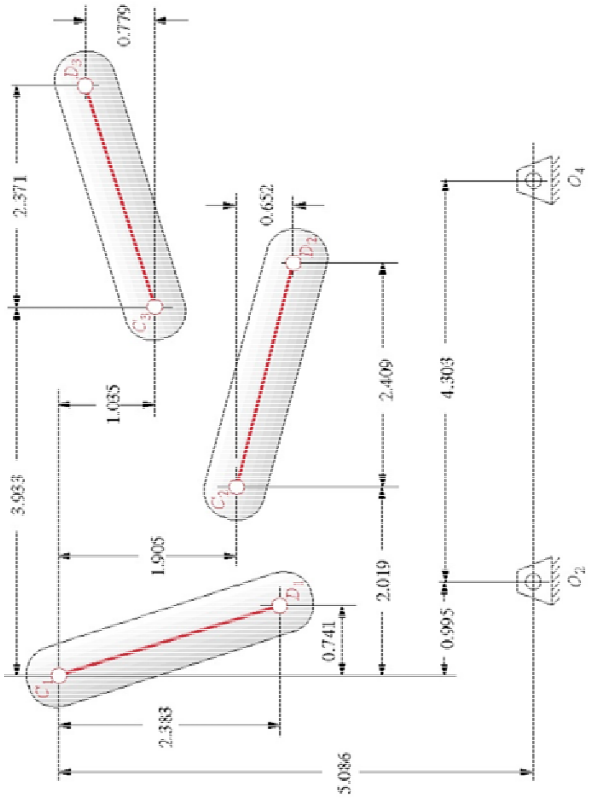

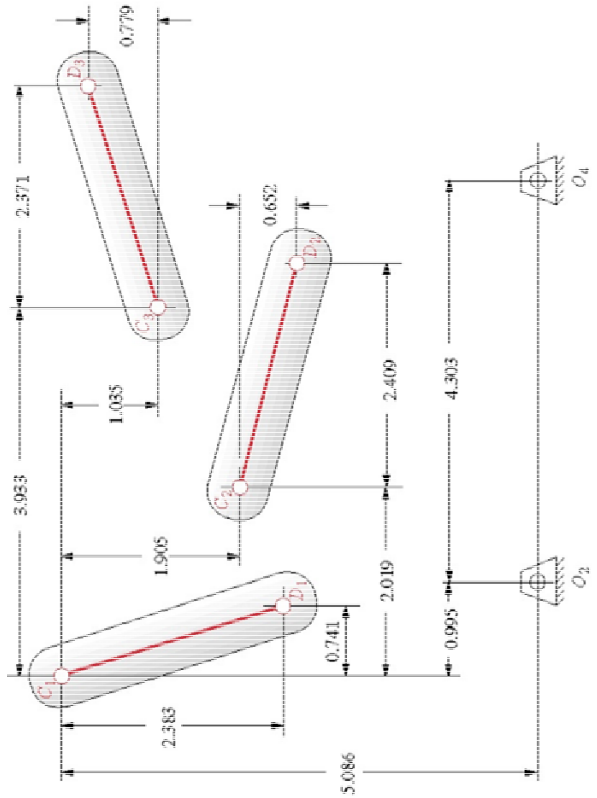
0.779
2.371
0.652
2.409
4.303
1.035
3.953
1.905
2.019
0.741
0.995
2.383
5.086

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