MIDDLE EAST TECHNICAL UNIVERSITY
MECHANICAL ENGINEERING DEPARTMENT
ME 301 THEORY OF MACHINES I
FALL 2025

PROJECT 1

Prepared by : Nuri KAFALI

Mail : nkafali@metu.edu.tr

Due Date : 04.12.2025 @23:59

Submission Method: ODTUClass (pdf file)

You are expected to provide

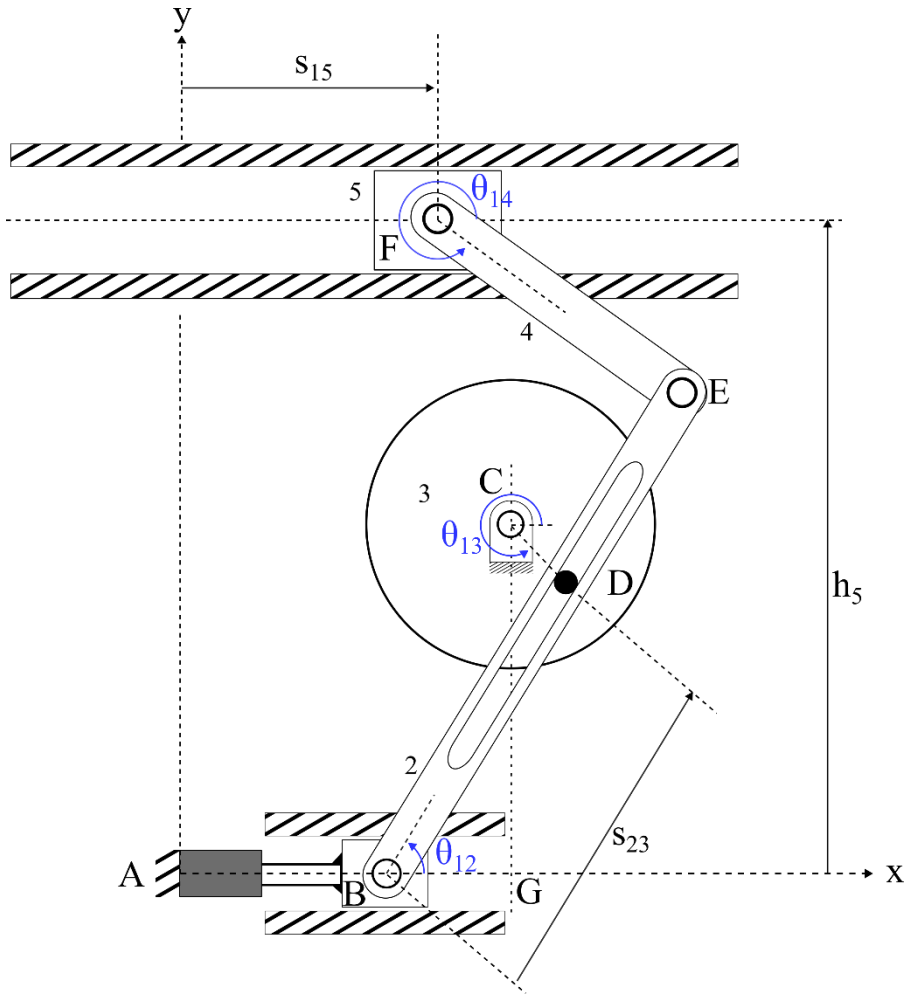
- ✓ *a pdf file with StudentID_P1.pdf notation,*
- ✓ *clear explanation of each step of your solution and numbered pages,*
- ✓ *units,*
- ✓ ***well annotated, scaled plots (title, axis labels, grid, legend), not random hand sketches,***
- ✓ ***source code attached to your solution if you use a software package in your calculations,***
- ✓ *properly numbered pages as current page out of total page.*

Your grades are subjected to these items as well as your calculations. Also, even though team-work type efforts are encouraged; they must not go beyond discussions on the solution methods used and/or cross-checking the results. Therefore, every homework paper that you will be handing in should be personalized by fully and correctly reflecting your own approaches and efforts in it.

Problem

The following figure represents the drawing of the Whitworth Mechanism from the second and third homework assignments. In the third homework, you derived the analytical expressions for the position variables s_{23}, θ_{12}, θ_{14}, and s_{15} in terms of the input joint variable θ_{13}. Using the expressions obtained in the third homework, perform a full-cycle position analysis **for the given closure** of the mechanism, for θ_{13} ranging from 0 to 360 degrees in increments of at most 1 degree. Plot the variations of all unknown joint variables using degrees and millimeters as the units in your plots.

You may use any suitable tool or programming language of your choice. Include your script or a screenshot of the tool used to create the plots at the end of the project. **No credit** will be given if the script or screenshot is missing.



$|AB| = L_{AB} = 70\ mm; \quad |AG| = L_{AG} = 95\ mm; \quad |GC| = L_{GC} = 140\ mm; \quad |BD| = s_{23}\ ;$
$|CD| = L_{CD} = 50\ mm\ ; |BE| = L_{BE} = 230\ mm; |FE| = L_{FE} = 74\ mm; h_5 = 245\ mm$