COMPUTATIONAL KINEMATICS ASSIGNMENT
MS2105 KINEMATICS AND DYNAMICS

Please perform the kinematics analysis for a 2-DoF planar manipulator, as shown in Figure 1. You must write down all the matrices needed for the kinematics analysis in A4 papers and write a program in MATLAB or Octave.

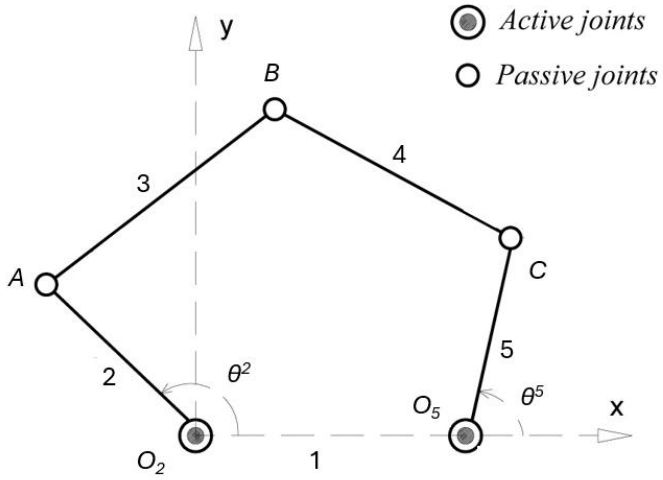

Figure 1 2-DoF planar manipulator

The **input** for the program are the geometry or dimension of the mechanism, the angular velocity of link 2 and link 5, are given below.

$$O_2O_5 = 300 \text{ mm} \qquad \omega^2 = XY + YZ \text{ rad/s}$$
$$O_2A = 200 \text{ mm} \qquad \omega^5 = XY + ZY \text{ rad/s}$$
$$AB = 400 \text{ mm} \qquad \theta_0^2 = 0^o$$
$$BC = 300 \text{ mm} \qquad \theta_0^5 = 0^o$$
$$O_5C = 200 \text{ mm}$$

where:
XYZ : last three digits of your NIM, i.e. 13124XYZ

The expected **output** are the plots of:

1. Position (in *x*-direction and *y*-direction) of joint *B* vs. time in Global Coordinate System
2. Linear velocity (in *x*-direction and *y*-direction) of joint *B* vs. time in Global Coordinate System
3. Linear acceleration (in *x*-direction and *y*-direction) of joint *B* vs. time in Global Coordinate System
4. Angular velocity of link 3 and 4 vs. time, $(\omega^3 - t)$, $(\omega^4 - t)$
5. Angular acceleration of link 3 and 4 vs. time, $(\alpha^3 - t)$, $(\alpha^4 - t)$

You may use the simulation time from 0 s to 5 s, $t = 0 - 5$ [s]

Submission and due date:
You should submit following documents or files:

1. All the matrices required in the kinematics analysis (e.g. constraint matrix, Jacobian matrix, etc.) in pdf file
2. The syntax of your program (with extension .m)
3. All the expected plots in .jpg or .png file.

Please submit all the documents or files in .rar or .zip extension to submission form of each class before **Sunday, 21 December 2025**.