```matlab
% For constant tourque 5Nm

clc

clear

TR = [0 5]; % time RANGE

X0 = [0;0;0;0];%initial conditions

[t,z] = ode45(@func1, TR, X0);%calling thr ide solver to solve by function

%storing given array as vectors

theta1 = z(:, 1);

AngVel1 = z(:, 2);

theta2 = z(:, 3);

AngVel2 = z(:, 4);


%plotting the angular displacements and velocities

acc1 = diff(AngVel1);

acc2= diff(AngVel2);

plot(t,theta1,t,AngVel1,t,[0;acc1],t,theta2,t,AngVel2,t,[0;acc2]);

xlabel('time')

legend('Angular Displacement 1','Angular Velocity 1','Angulara acceleration 1','Angular Displacement 2','Angular
Velocity 2','Angulara acceleration 2')

ylabel('position & Velocity')

title("m-file")

%function containing the differentialequations

function dx = func1(~, x)

% Values of Coefficients

J1=1; J2=10; D1=0.9; D2=0.02; k=3;T=5;


% State Equations

dx(1) = x(2);

dx(3) = x(4);

dx(2) = (T-D1*x(2)-k*x(1)+k*x(3))/J1;

dx(4) = (-k*x(3)-D2*x(4)+k*x(1))/J2;

dx = dx';

end
```
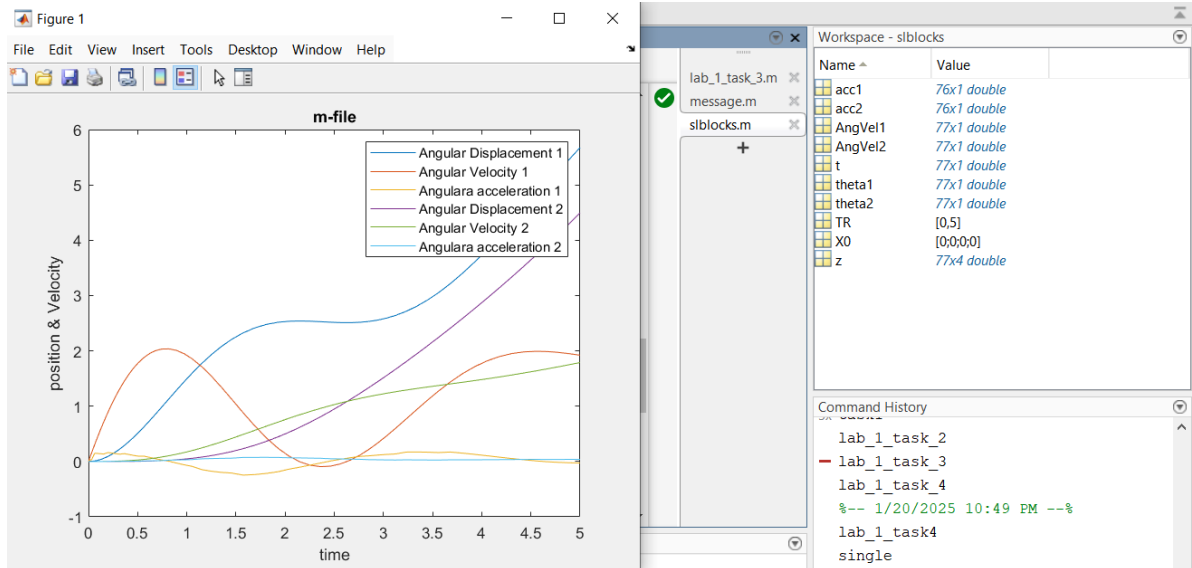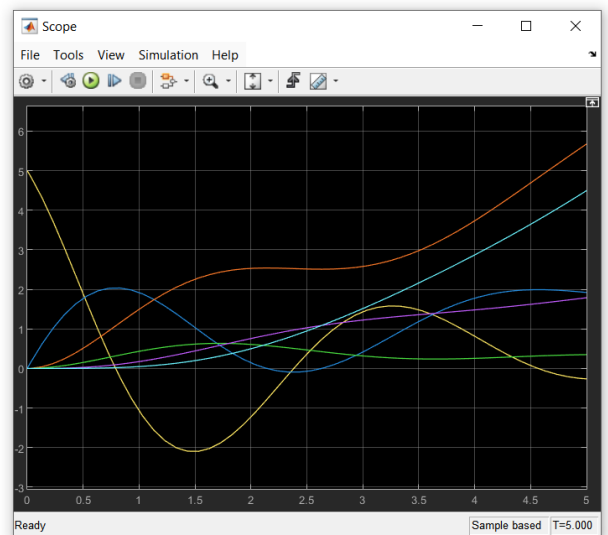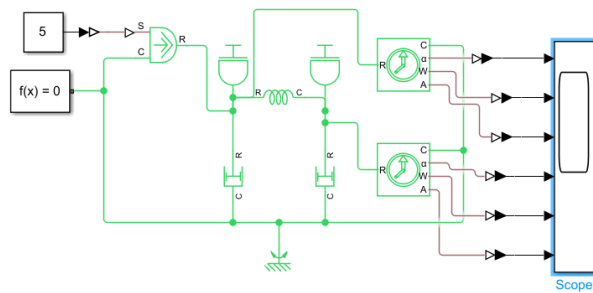
m-file

Angular Displacement 1
Angular Velocity 1
Angulara acceleration 1
Angular Displacement 2
Angular Velocity 2
Angulara acceleration 2

| Name ▲ | Value |
| --- | --- |
| acc1 | 76x1 double |
| acc2 | 76x1 double |
| AngVel1 | 77x1 double |
| AngVel2 | 77x1 double |
| t | 77x1 double |
| theta1 | 77x1 double |
| theta2 | 77x1 double |
| TR | [0,5] |
| X0 | [0;0;0;0] |
| z | 77x4 double |

Command History

lab_1_task_2
lab_1_task_3
lab_1_task_4
%-- 1/20/2025 10:49 PM --%
lab_1_task4
single

simulink

From input "Constant" to output "THETA_3":
                    0.3
---------------------------------------
s^4 + 0.902 s^3 + 3.002 s^2 + 0.006 s

A =

|         | OMEGA_1 | OMEGA_2 | THETA_1 | THETA_3 |
|---------|---------|---------|---------|---------|
| OMEGA_1 | -0.9    | 0       | -3      | 0       |
| OMEGA_2 | 0       | -0.002  | 0.3     | 0       |
| THETA_1 | 1       | 0       | 0       | 0       |
| THETA_3 | 0       | 1       | 0       | 0       |
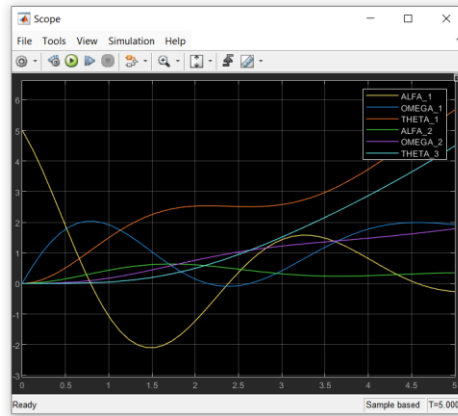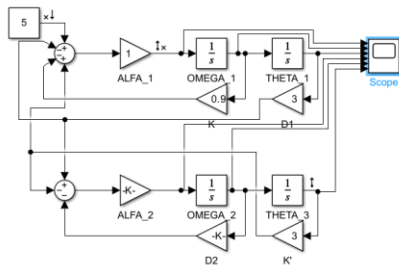
From input "Constant" to output "PS-Simulink Converter4":

$$\frac{0.3}{s^4 + 0.902\ s^3 + 3.302\ s^2 + 0.276\ s}$$

A =

|  | task1.Task1_ | task1.Task1_ | task1.Task1_ | task1.Task1_ |
|---|---|---|---|---|
| task1.Task1_ | -0.9 | 0 | 0 | -3 |
| task1.Task1_ | 1 | 0 | 0 | 0 |
| task1.Task1_ | 0 | 0 | -0.002 | 0.3 |
| task1.Task1_ | 1 | 0 | -1 | 0 |