Problem 2

# **CODE:**

% PROBLEM 2

% Clear workspace

close all

clear

clc

% Define the system matrices

Ap = [3, 1; -2, 2];

Bp = [0; 1];

Cp = [3, 1];

Dp = [0; 1];

Mp = [1, 0];

By = 1;

Dy = 2;

Bz = 0;

Dz = 2;

Ac = -4;

Bc = 2;

Cc = 1;

Dc = -2;

% Closed loop system equations

fprintf(['xdot\_cl = A\_cl\*x\_cl + B\_cl\*w\n' ...

'y = C\_cl\*x\_cl + D\_cl\*w\n' ...

'where,']);

A\_cl = [Ap+Bp\*Dc\*Mp, Bp\*Cc; Bc\*Mp, Ac]

B\_cl = [Dp+Bp\*Dc\*Dz; Bc\*Dz]

C\_cl = [Cp+By\*Dc\*Mp, By\*Cc]

D\_cl = Dy+By\*Dc\*Dz

% Check the stability by computing the eigenvalues of A\_cl

eigenvalues = eig(A\_cl);

% Check if all eigenvalues have negative real parts

if all(real(eigenvalues) < 0)

disp('The closed-loop system is stable.');

else

disp('The closed-loop system is not stable.');

end

% Calculate the H-infinity norm

h\_inf\_norm = hinfnorm(ss(A\_cl, B\_cl, C\_cl, D\_cl));

disp(['The H-infinity norm of the closed-loop system is: ' num2str(h\_inf\_norm)]);

# **OUTPUT:**

xdot\_cl = A\_cl\*x\_cl + B\_cl\*w

y = C\_cl\*x\_cl + D\_cl\*w

where,

A\_cl = 3×3

3 1 0

-4 2 1

2 0 -4

B\_cl = 3×1

0

-3

4

C\_cl = 1×3

1 1 1

D\_cl = -2

The closed-loop system is not stable.

The H-infinity norm of the closed-loop system is: Inf

# **SCREENSHOT:**

