Problem 3

CODE:

```
% PROBLEM 3


% Clear workspace
close all
clear
clc


% Define the system matrices
A1 = [-4, 1; 0, 2];
B1 = [1; 0];
A2 = [-3, 2; 4, 1];
B2 = [0; 1];


% Compute controllability matrices
R1 = ctrb(A1, B1);
R2 = ctrb(A2, B2);


% Check rank of controllability matrices
if(rank(R1)==size(R1,2))
    fprintf("System 1 can be stabilized by a static state-feedback control law")
    % If stabilizable, find state feedback gains
    desiredPoles1 = [-1, -2]; % Adjust these poles as needed
    K1 = acker(A1, B1, desiredPoles1);
    disp('State feedback gains for System 1:');
    disp(K1);
    disp('These state feedback gains place System 1 poles at:');
    disp(desiredPoles1)
else
    fprintf("System 1 cannot be stabilized by a static state-feedback control
law")
end


if(rank(R2)==size(R2,2))
    fprintf("System 2 can be stabilized by a static state-feedback control law")
    % If stabilizable, find state feedback gains
    desiredPoles2 = [-1, -2]; % You can adjust these poles as needed
    K2 = acker(A2, B2, desiredPoles2);
    disp('State feedback gains for System 2:');
```

```
    disp(K2);
    disp('These state feedback gains place System 2 poles at:');
    disp(desiredPoles2)
else
    fprintf("System 2 cannot be stabilized by a static state-feedback control
law")
end
```

OUTPUT:

```
System 1 cannot be stabilized by a static state-feedback control law
System 2 can be stabilized by a static state-feedback control law
State feedback gains for System 2:
     5     1
These state feedback gains place System 2 poles at:
    -1    -2
```

SCREENSHOT: