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%%Problem 5

% Verify transfer function

w = 5

H1 = tf([1],[1 0 w^2]);

H2 = tf([1],[1 0]);

H3 = tf([1 0],[1 0 w^2]);

y = (H2+H3)\*H1;

% Select the system matrices

syms w s

A = [0 -2\*w^2 0 -w^4 0;...  
1 0 0 0 0;...  
0 1 0 0 0;...  
0 0 1 0 0;...  
0 0 0 1 0];

B = [1;0;0;0;0];

C = [0 0 2 0 w^2];

D = 0;

% Verify that the selected system gives the same transfer function;

G = C\*inv(s\*eye(5)-A)\*B;

G = simplify(G);

% Compute the Jordan normal form of the matrix A

[V,J] = jordan(A)

w =

5

V =

[ 0, -(w\*1i)/4, 1/2, (w\*1i)/4, 1/2]  
[ 0, 1/4, 1i/(4\*w), 1/4, -1i/(4\*w)]  
[ 0, 1i/(4\*w), 0, -1i/(4\*w), 0]  
[ 0, -1/(4\*w^2), 1i/(4\*w^3), -1/(4\*w^2), -1i/(4\*w^3)]  
[ 1/w^4, -1i/(4\*w^3), -1/(2\*w^4), 1i/(4\*w^3), -1/(2\*w^4)]

J =

[ 0, 0, 0, 0, 0]  
[ 0, -w\*1i, 1, 0, 0]  
[ 0, 0, -w\*1i, 0, 0]  
[ 0, 0, 0, w\*1i, 1]

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[ 0,      0,      0,      0, w*1i]
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