ESE 531 Recitation 8

ESE531_Recitation_8_HW5MP4.m

```
%% (a)

j = sqrt(-1);

poles = [0.9 0.6718*(1+j) 0.6718*(1-j)];

zeroes = [-1 j -j];

gain = 1/77;

sys = zpk(zeroes,poles,gain,-1);

figure
pzmap(sys) % plot pole-zero plot
pbaspect([1 1 1]);
xlim([-1.2 1.2])
ylim([-1.2 1.2])

%% (c)

n = -20:100; % time stamps
delta = zeros(121,1);
delta(21) = 1; % define the delta function

[b, a] = zp2tf(zeroes, poles, gain); % convert roots of the polynomial
                                     %to the coefficients of the polynomial
y = filter(b, a, delta); % impulse response

stem(n,y)
xlabel('n');
ylabel('h[n]');

%% (d)

n1 = -19:80;

x = ones(100,1);
I = find(n1 < 0);
x(I) = 0; % define unit step function

% stem(x)

y1 = filter(b, a, x); % step response
figure
stem(n1, y1)
xlabel('n');
ylabel('h_{step}[n]');

%% (e)

% The input should cancel the effect of two complex poles in the transfer
% function of the system

C = poly([0.6718*(1+j) 0.6718*(1-j)]);

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53
54 -   C = poly([0.6718*(1+j) 0.6718*(1-j)]);
55
56 -   n1 = -19:80;
57
58 -   x1 = zeros(100,1);
59 -   x1(20) = C(1); % x1[n] = C(1)*δ[n] + C(2)*δ[n+1] + C(3)*δ[n+2]
60 -   x1(21) = C(2);
61 -   x1(22) = C(3);
62
63 -   figure
64 -   stem(n1,x1); % plot input with length 3
65 -   xlabel('n');
66 -   ylabel('x_3[n]')
67
68 -   y2 = filter(b, a, x1);
69
70 -   figure
71 -   stem(n1,y2) % plot output
72 -   xlabel('n');
73 -   ylabel('y_3[n]')
74
75
76    %% (b)
77
78    function [b, a] = zp2tf(z,p,k)
79 -      b = k*poly(z);
80 -      a = poly(p);
81 -  end
82
```