Homework 4

## Problem 4.1

clc;

clear;

% a -----------------------------------------------------------------------

% Define the values of n for which you want to calculate γ[n]

n\_alpha\_a = -2:1;

n\_beta\_a = 0:4;

% origin offset of each function

origin\_alpha\_a = 3; % n=0 is the third index

origin\_beta\_a = 1; % n=0 is the first index

% Define the first pair of α[n] and β[n]

alpha\_a = (-0.9).^(1 - n\_alpha\_a);

alpha\_a(2) = 0; % corrects n= -1

beta\_a = cos(0.25 .\* pi .\* n\_beta\_a);

beta\_a(1) = 0;

% Calculate γ[n] for the first pair

gamma\_a = conv(alpha\_a, beta\_a);

% Calculate alignment for the graph

origin\_gamma\_a = origin\_alpha\_a + origin\_beta\_a - 1;

n\_gamma\_a = (0:length(gamma\_a)-1)-(origin\_gamma\_a - 1);

% Plot the nonzero values of γ[n] vs. n for both pairs

figure;

plot(n\_gamma\_a, gamma\_a);

title('Part A');

xlabel('n');

ylabel('γ[n]');

grid on;

% b -----------------------------------------------------------------------

% Define the values of n for which you want to calculate γ[n]

n\_alpha\_b = -1:3;

n\_beta\_b = 1:5;

% origin offset of each function

origin\_alpha\_b = 2; % n=0 is the third index

origin\_beta\_b = -1;

% Define the second pair of α[n] and β[n]

alpha\_b = 36 .^ (n\_alpha\_b / 2 - 1);

beta\_b = (1 ./ (n\_beta\_b + 1));

% Calculate γ[n] for the first pair

gamma\_b = conv(alpha\_b, beta\_b);

% Calculate alignment for the graph

origin\_gamma\_b = origin\_alpha\_b + origin\_beta\_b - 1;

n\_gamma\_b = (0:length(gamma\_b)-1)-(origin\_gamma\_b - 1);

% Plot the nonzero values of γ[n] vs. n for both pairs

figure;

plot(n\_gamma\_b, gamma\_b);

title('Part B');

xlabel('n');

ylabel('γ[n]');

grid on;

A graph on a screen

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## Problem 4.2

clc;

clear;

% a -----------------------------------------------------------------------

yzi(1) = 7; % yzi[-2] = 7

yzi(2) = -2.5; % yzi[-1] = -2.5

for k=3:18

yzi(k) = 0.9 \* yzi(k-1) - 0.81 \* yzi(k-2); % calculate each value

% of y(k)

end

k = -2:length(yzi)-3; % length of k same as y

figure;

plot(k, -yzi);

title('Part A');

xlabel('n');

ylabel('γ[n]');

grid on;

% b -----------------------------------------------------------------------

yzs(1) = 0; % yzs[-2] = 0

yzs(2) = 0; % yzs[-1] = 0

stepn\_1 = [zeros(1,3) ones(1,15)];

k;

x = (0.5 .^ k) .\* stepn\_1;

for k=3:18

yzs(k) = 0.9 \* yzs(k-1) - 0.81 \* yzs(k-2) + 10\*x(k) - 15\*x(k-2); % calculate each value

end

k = -2:length(yzs)-3;

figure;

plot(k, yzs);

title('Part B');

xlabel('n');

ylabel('γ[n]');

grid on;

% c -----------------------------------------------------------------------

delta = [zeros(1, 3) ones(1, 15)]; % shows which values in the range are negative or positive

h(1) = 0; % h[-2] = 0

h(2) = 0; % h[-1] = 0

for k=3:18

h(k) = 0.9 \* h(k-1) - 0.81 \* h(k-2) + 10 \* delta(k) - 15 \* delta(k-2);

end

k = -2:length(h)-3;

figure;

plot(k,h);

title('Part C');

xlabel('n');

ylabel('γ[n]');

grid on;

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## Problem 4.3

clc;

clear;

% a -----------------------------------------------------------------------

yzi(1) = -3; % yzi[-2] = -3

yzi(2) = 1.5; % yzi[-1] = 1.5

for k=3:18

yzi(k) = -0.12 \* yzi(k-1) + 0.24 \* yzi(k-2); % calculate each value

% of y(k)

end

k = -2:length(yzi)-3; % length of k same as y

figure;

plot(k, -yzi);

title('Part A');

xlabel('n');

ylabel('γ[n]');

grid on;

% b -----------------------------------------------------------------------

yzs(1) = 0; % yzs[-2] = 0

yzs(2) = 0; % yzs[-1] = 0

stepn\_1 = [ones(1,18)];

k;

x = cos(0.15 \* pi \* k - ((15\*pi)/180)) .\* stepn\_1;

for k=3:18

yzs(k) = -0.12 \* yzs(k-1) + 0.24 \* yzs(k-2) - 6 \* x(k-1) + 2 \* x(k-2);

end

k = -2:length(yzs)-3;

figure;

plot(k, yzs);

title('Part B');

xlabel('n');

ylabel('γ[n]');

grid on;

% c -----------------------------------------------------------------------

delta = [ones(1, 18)]; % shows which values in the range are negative or positive

h(1) = 0; % h[-2] = 0

h(2) = 0; % h[-1] = 0

for k=3:18

h(k) = -0.12 \* h(k-1) + 0.24 \* h(k-2) - 6 \* delta(k-1) + 2 \* delta(k-2);

end

k = -2:length(h)-3;

figure;

plot(k,h);

title('Part C');

xlabel('n');

ylabel('γ[n]');

grid on;

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