**Task1**

%5 Terms

syms t

t0 = 0;

T = 2;

w = 2\*pi/T;

% Define x(t) using Heaviside function

x = heaviside(t) - heaviside(t-1);

figure;

ezplot(x, [0 2]);

title('Original Signal x(t)');

legend('x(t)');

grid on;

% Compute Fourier Series Coefficients

figure;

k = -2:2; % Now using 5 terms (-2 to 2)

a = (1/T) \* int(x \* exp(-1j\*k\*w\*t), t,

t0, t0+T); % Compute a\_k

% Plot Magnitude of Fourier Coefficients

figure;

stem(k, abs(a), 'filled');

xlabel('k');

ylabel('|a\_k|');

title('Magnitude of Fourier Coefficients

(5 terms)');

legend('|a\_k| , k=-2:2');

grid on;

% Plot Phase of Fourier Coefficients

figure;

stem(k, angle(a), 'filled');

xlabel('k');

ylabel('?a\_k (radians)');

title('Phase of Fourier Coefficients (5

terms)');

legend('\angle a\_k , k=-2:2');

grid on;

% Fourier Series Approximation

figure;

xx = sum(a .\* exp(1j\*k\*w\*t)); %

Approximation with 5 terms

ezplot(xx, [0 2]);

title('Fourier Series Approximation with

5 Terms');

legend('Approximation with 5 terms');

grid on;

1.1 =>

syms t

t0 = 0; T = 2; w = 2\*pi/T;

x = heaviside(t) - heaviside(t - 1);

% Plot original signal

figure;

ezplot(x, [0 2]);

title('Original Signal x(t)');

k = -10:10;

a = (1/T) \* int(x \* exp(-1j \* k \* w \* t), t, t0, t0 + T);

figure;

stem(k, abs(a), 'filled');

title('Magnitude of Fourier Coefficients');

figure;

stem(k, angle(a), 'filled');

title('Phase of Fourier Coefficients');

xx = sum(a .\* exp(1j \* k \* w \* t));

figure;

ezplot(xx, [0 2]);

title('Fourier Series Approximation);

stem(k, abs(a));

legend('|a\_k| , k=-5:5');

figure

stem(k, angle(a));

legend('\angle a\_k , k=-5:5');

% Approximation

figure

xx = sum(a .\* exp(j\*k\*w\*t));

ezplot(xx, [0 2]);

legend('Approx. with 11 terms');

syms t

t0 = 0;

T = 2;

w = 2\*pi/T;

x = heaviside(t) - heaviside(t-1);

ezplot(x, [0 2]);

legend('x(t)')

figure

k = -5:5; % Using only 5 terms (-5 to 5)

a = (1/T) \* int(x \* exp(-j\*k\*w\*t), t, t0, t0+T);

syms t

t0 = 0;

T = 2;

w = 2\*pi/T;

x = heaviside(t) - heaviside(t-1);

% Plot original signal

figure;

ezplot(x, [0 2]);

title('Original Signal x(t)');

% Compute Fourier Series Coefficients

k = -30:30;

a = (1/T) \* int(x \* exp(-1j\*k\*w\*t), t, t0, t0+T);

% Plot Magnitude of Fourier Coefficients

figure;

stem(k, abs(a), 'filled');

title('Magnitude of Fourier Coefficients (61 terms)');

% Plot Phase of Fourier Coefficients

figure;

stem(k, angle(a), 'filled');

title('Phase of Fourier Coefficients (61 terms)');

% Fourier Series Approximation

figure;

xx = sum(a .\* exp(1j\*k\*w\*t));

ezplot(xx, [0 2]);

title('Fourier Series Approximation with 61 Terms');