## EXP<sub>7</sub>

## Title:

# Simulation study of OFDM transmitter and reciever

```
clc;
clear all;
N = 64;
            % Number of subcarriers
M = 16; % Modulation order (QPSK)
cpLen = 16;
             % Length of cyclic prefix
numSymbols = 1; % Number of OFDM symbols (for visualization)
              % Signal-to-noise ratio in dB
snr = 20;
% Generate random data
data = randi([0 M-1], numSymbols * N, 1); % Random data
% QPSK modulation
modData = pskmod(data, M, pi/4); % Modulate using QPSK
% OFDM Modulation
ofdmSymbols = reshape(modData, N, numSymbols); % Reshape data
ifftData = ifft(ofdmSymbols, N);
                                     % IFFT
cyclicPrefix = ifftData(end-cpLen+1:end, :); % Generate cyclic prefix
ofdmSignal = [cyclicPrefix; ifftData]; % Add cyclic prefix
% Time Domain Response
figure;
subplot(2,1,1);
plot(real(ofdmSignal)); % Plot real part of the OFDM signal
title('Time Domain OFDM Signal');
xlabel('Samples');
ylabel('Amplitude');
```

grid on;

#### % Frequency Domain Response

frequencySpectrum = fft(ofdmSignal, 2048); % FFT of the OFDM signal

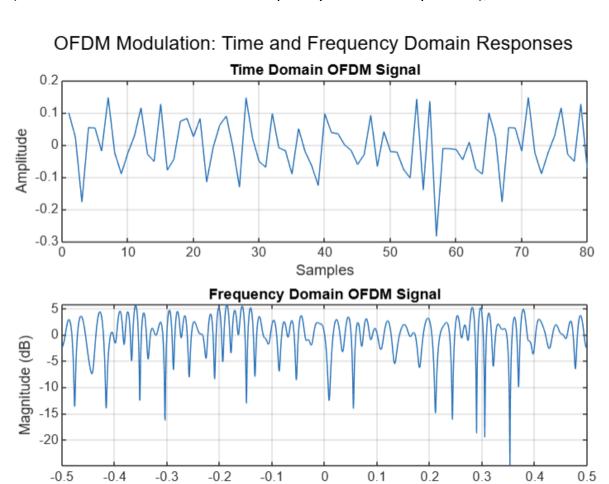
f = linspace(-0.5, 0.5, length(frequencySpectrum)); % Frequency axis

magnitudeSpectrum = abs(fftshift(frequencySpectrum)); % Shift zero frequency component to center

subplot(2,1,2);
plot(f, 20\*log10(magnitudeSpectrum)); % Plot magnitude spectrum in dB title('Frequency Domain OFDM Signal');
xlabel('Normalized Frequency');
ylabel('Magnitude (dB)');
grid on;
axis tight;

### % Show the figure

sgtitle('OFDM Modulation: Time and Frequency Domain Responses');



Normalized Frequency