message\_frequency = 500;

sampling\_frequency = 2000;

num\_samples = 100;

bit\_depths = [8, 10];

T = 1 / sampling\_frequency;

duration = num\_samples \* T;

t = linspace(0, duration, num\_samples);

message\_signal = sin(2\*pi\*message\_frequency\*t);

sampled\_signal = message\_signal;

quantize = @(x, levels) round((x + 1) \* (levels - 1) / 2) \* 2 / (levels - 1) - 1;

quantized\_signals = cell(length(bit\_depths), 1);

for i = 1:length(bit\_depths)

bit\_depth = bit\_depths(i);

levels = 2^bit\_depth;

quantized\_signal = quantize(sampled\_signal, levels);

quantized\_signals{i} = quantized\_signal;

end

encoded\_signals = quantized\_signals;

% Plot original message signal

figure;

plot(t, message\_signal);

title('Original Message Signal');

xlabel('Time (seconds)');

ylabel('Amplitude');

saveas(gcf, 'Original\_Message\_Signal.png');

% Plot sampled signal

figure;

plot(t, sampled\_signal, 'o');

title('Sampled Signal');

xlabel('Time (seconds)');

ylabel('Amplitude');

saveas(gcf, 'Sampled\_Signal.png');

% Plot quantized signals

for i = 1:length(bit\_depths)

bit\_depth = bit\_depths(i);

quantized\_signal = quantized\_signals{i};

figure;

plot(t, quantized\_signal);

title(['Quantized Signal - ', num2str(bit\_depth), ' bit(s)']);

xlabel('Time (seconds)');

ylabel('Amplitude');

saveas(gcf, ['Quantized\_Signal\_', num2str(bit\_depth), '\_bits.png']);

end

% Plot encoded signals

for i = 1:length(bit\_depths)

bit\_depth = bit\_depths(i);

encoded\_signal = encoded\_signals{i};

figure;

plot(t, encoded\_signal);

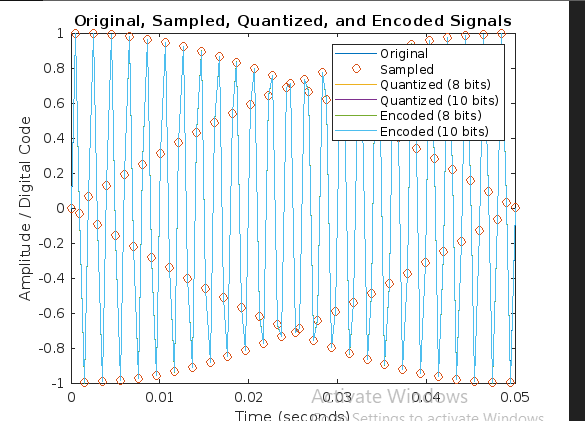
title(['Encoded Signal - ', num2str(bit\_depth), ' bit(s)']);

xlabel('Time (seconds)');

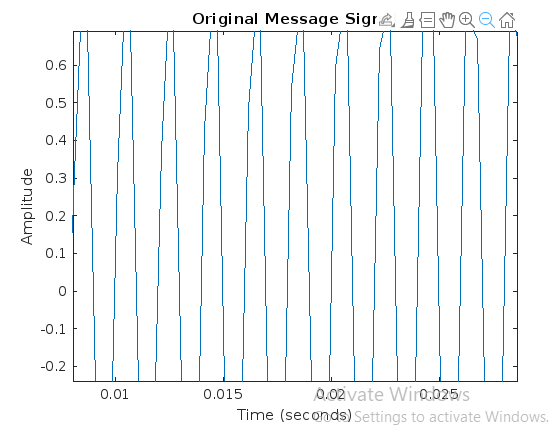
ylabel('Digital Code');

saveas(gcf, ['Encoded\_Signal\_', num2str(bit\_depth), '\_bits.png']);

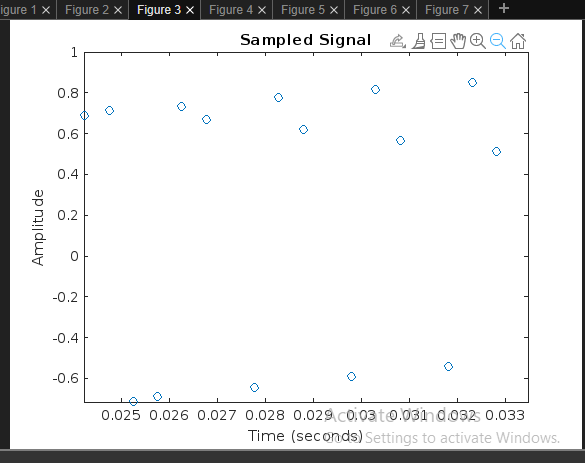
end



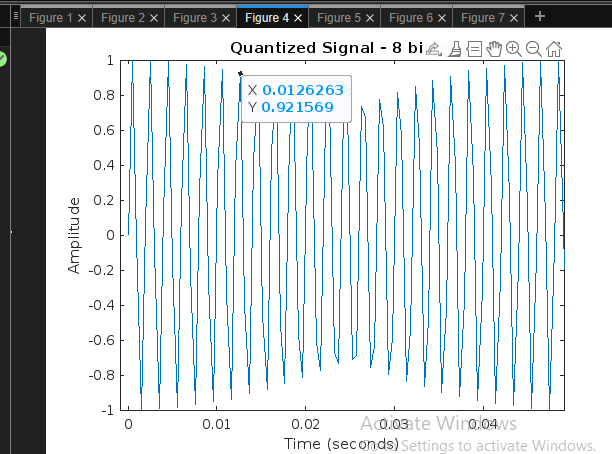
Original signal:



Sampled



Quantized 8 bits:



Quantized 10 bits:

A screen shot of a graph

Description automatically generated

Encoded:

A screen shot of a computer screen

Description automatically generated

Encoded 10 bits:

A screen shot of a graph

Description automatically generated

All in one graph:

A screenshot of a computer screen

Description automatically generated