Experiment No 03

BECS 32461

Paper C

**VERIFICATION OF SAMPLING THEOREM IN TIME DOMAIN**

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**PROCEDURE**

F01.

% Amplitude and Frequency

A = 1; F = 2;

%Time vector for continuous signal

t = 0:0.001:1;

% Continuous-time sine wave

x\_a = A\*sin(2\*pi\*F\*t);

figure;

subplot(3,1,1)

plot(t,x\_a,'-b')

title('Analogue (Continuous) Input Signal')

ylabel('x\_a','Interpreter','tex')

xlabel('time(sec)')

% Sampling at Nyquist rate

F\_s = 2\*F;

% Sampling points

n = 0:1/F\_s:1;

% Discrete-time signal

x\_s = A\*sin(2\*pi\*F\*n);

subplot(3,1,2)

stem(n,x\_s,'-b')

title('Discreete Time Signal ( F\_s = 2\*F)','Interpreter','tex')

xlabel('samples(n)')

ylabel('x\_s','Interpreter','tex')

% Time vector for reconstruction

t\_r = linspace(0, 1, 1000);

% Reconstruct signal using linear interpolation

x\_linear = interp1(n, x\_s, t\_r, 'linear');

% Reconstruct signal using spline interpolation

x\_spline = interp1(n, x\_s, t\_r, 'spline');

subplot(3,1,3)

hold on

plot(t\_r,x\_spline,'-b')

title('Reconstructed Signal ( F\_s = 2\*F)','Interpreter','tex')

xlabel('time(sec)')

ylabel('x\_r','Interpreter','tex')

A diagram of a function

AI-generated content may be incorrect.

F02.

% Amplitude and Frequency

A = 1; F = 2;

%Time vector for continuous signal

t = 0:0.001:1;

% Continuous-time sine wave

x\_a = A\*sin(2\*pi\*F\*t);

figure;

subplot(3,1,1)

plot(t,x\_a,'-b','LineWidth',1.5)

title('Analogue (Continuous) Input Signal')

ylabel('x\_a','Interpreter','tex')

xlabel('time(sec)')

% Sampling at Nyquist rate

F\_s = 10\*F;

% Sampling points

n = 0:1/F\_s:1;

% Discrete-time signal

x\_s = A\*sin(2\*pi\*F\*n);

subplot(3,1,2)

stem(n,x\_s,'-b','LineWidth',1.5)

title('Discreete Time Signal ( F\_s > 2\*F)','Interpreter','tex')

xlabel('samples(n)')

ylabel('x\_s','Interpreter','tex')

% Time vector for reconstruction

t\_r = linspace(0, 1, 1000);

% Reconstruct signal using linear interpolation

x\_linear = interp1(n, x\_s, t\_r, 'linear');

% Reconstruct signal using spline interpolation

x\_spline = interp1(n, x\_s, t\_r, 'spline');

subplot(3,1,3)

hold on

plot(t\_r,x\_spline,'-b','LineWidth',1.5)

title('Reconstructed Signal ( F\_s > 2\*F)','Interpreter','tex')

xlabel('time(sec)')

ylabel('x\_r','Interpreter','tex')

A graph with blue lines

AI-generated content may be incorrect.

F03.

% Amplitude and Frequency

A = 1; F = 2;

%Time vector for continuous signal

t = 0:0.001:1;

% Continuous-time sine wave

x\_a = A\*sin(2\*pi\*F\*t);

figure;

subplot(3,1,1)

plot(t,x\_a,'-b','LineWidth',1.5)

title('Analogue (Continuous) Input Signal')

ylabel('x\_a','Interpreter','tex')

xlabel('time(sec)')

% Sampling at Nyquist rate

F\_s = 1.5\*F;

% Sampling points

n = 0:1/F\_s:1;

% Discrete-time signal

x\_s = A\*sin(2\*pi\*F\*n);

subplot(3,1,2)

stem(n,x\_s,'-b','LineWidth',1.5)

title('Discreete Time Signal ( F\_s < 2\*F)','Interpreter','tex')

xlabel('samples(n)')

ylabel('x\_s','Interpreter','tex')

% Time vector for reconstruction

t\_r = linspace(0, 1, 1000);

% Reconstruct signal using linear interpolation

x\_linear = interp1(n, x\_s, t\_r, 'linear');

% Reconstruct signal using spline interpolation

x\_spline = interp1(n, x\_s, t\_r, 'spline');

subplot(3,1,3)

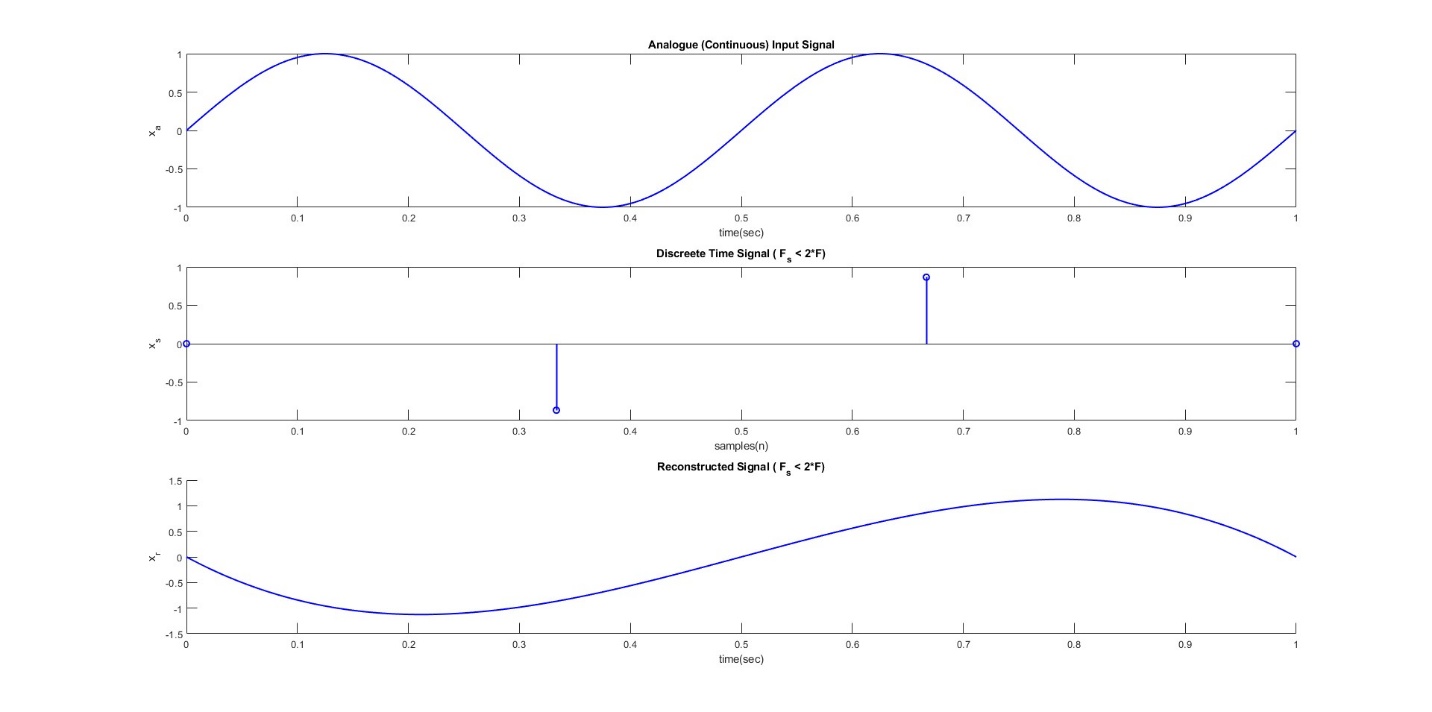
hold on

plot(t\_r,x\_spline,'-b','LineWidth',1.5)

title('Reconstructed Signal ( F\_s < 2\*F)','Interpreter','tex')

xlabel('time(sec)')

ylabel('x\_r','Interpreter','tex')



**EXERCISE**

E01.

E02.

E03.

E04.

E05.