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DIGITAL SIGNAL PROCESSING

LAB

TASK - 1

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Course code: ECE2006

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L35+L36

i. Generate a switched Sinusoidal signal. This is achieved by multiplying a square waveform and a sinusoidal waveform.

```
fs = 300;
t = 0:1/fs:1;
offset  = 1;
x1 = sin(2*pi*100*t);
x2 = offset + square(2*pi*10*t);
```

a. Let's assume the frequency of the square waveform is 2 KHz, with an amplitude of 1 volt peak-to-peak and offset of 0.3V.Let's also assume the frequency of the sin () signal is 10 KHz with an amplitude of 2 V peak-to-peak and no offset.
b. Using subplots show all three signals.

OBJECTIVE:

To generate a switched sinusoidal signal by the process of multiplying a square wave and a sine wave and to plot all three signals using subplot.

ALGORITHM/ PROCEDURE:

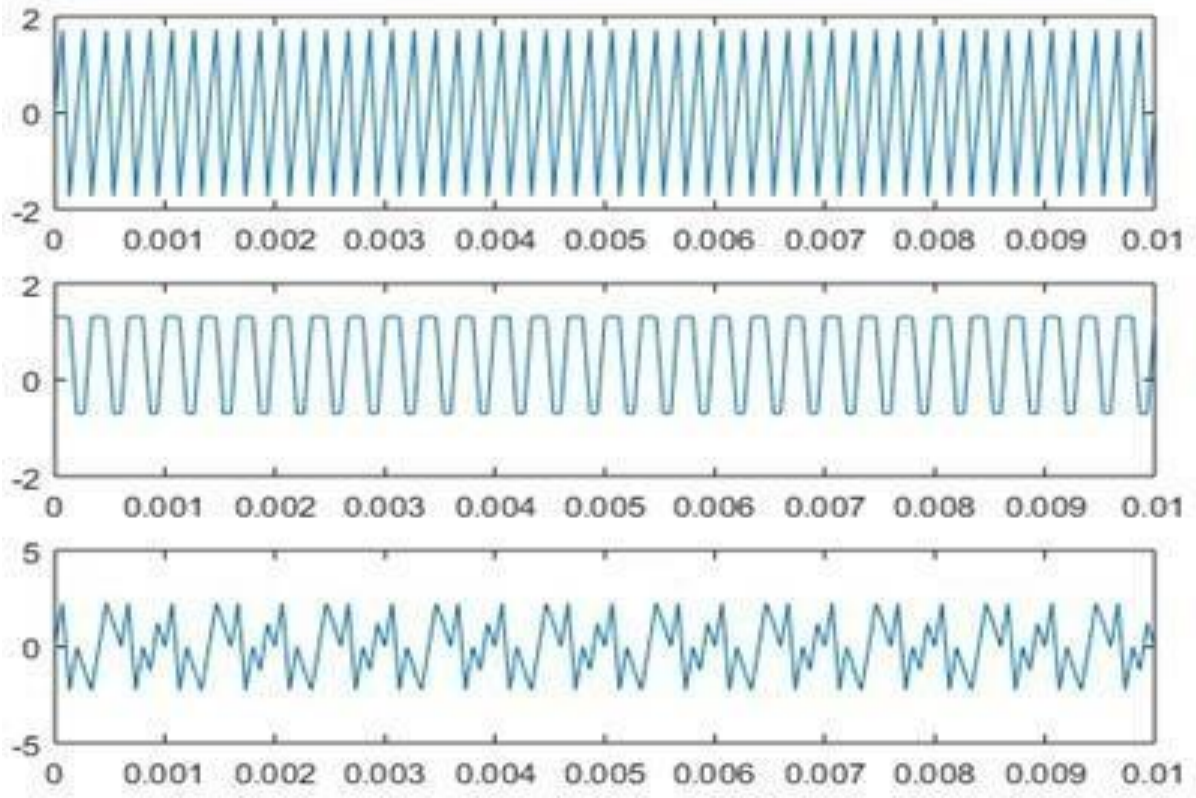
1. Define the sampling rate of the signal as per the frequency of the given signal
2. Define the signal along with their offset values.
3. Multiply the square wave and the sine wave to obtain switched sinusoidal signal.
4. Plot all the signals using subplot.

PROGRAM:

```
clc clear all
fs=15000;
t=0:1/fs:.01; offset1=0; offset2=0.3;
x1=offset1+2*sin(2*pi*5000*t); x2=offset2+1*square(2*pi*3000*t); x3=x1.*x2;
```

```
subplot(3,1,1);
plot(t,x1);
subplot(3,1,2);
plot(t,x2);
subplot(3,1,3);
plot(t,x3);
```

RESULT / INFERANCE:



Sine wave, square wave, switched sinusoidal signal

Let's assume the frequency of the square waveform is 500 Hz, with an amplitude of 2 volt peak-to-peak and offset of 0.5V.Let's also assume the frequency of the sin () signal is 5 KHz with an amplitude of 3 V peak-to-peak and no offset. Using subplots, show all three signals.

ii. Using the MATLAB, generate the following sequence and verify using manual calculation.
   a. u(n)+u(n-1)+3u(n)+2δ(n)
   b. u(n)+2r(n)+ δ(n)

OBJECTIVE:

To generate unit step function, unit impulse function and to compute x(n) and y(n) from the time indices

-10 to 20.

ALGORITHM/ PROCEDURE:

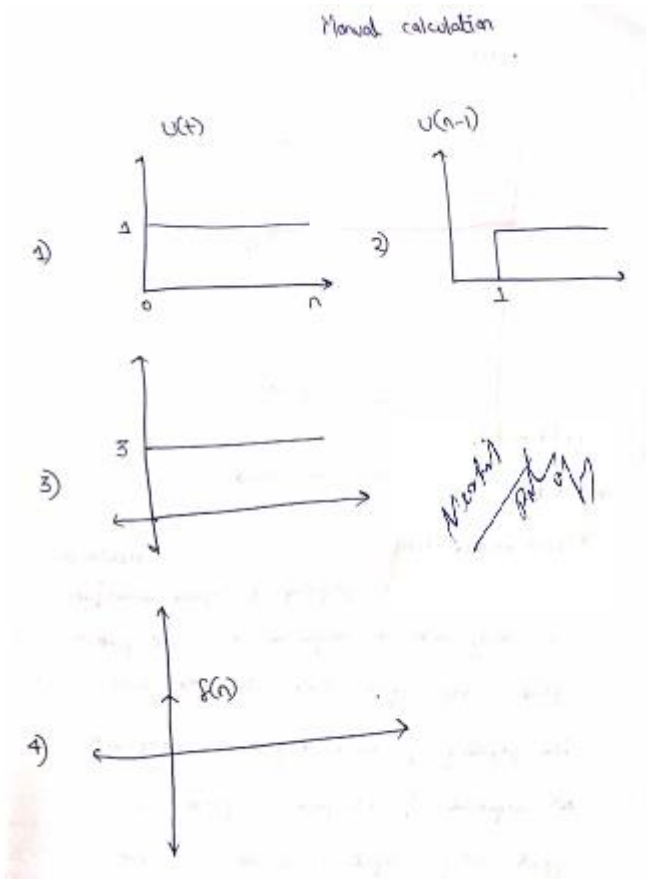
1. Define the indices that you want to display the signal
2. As per the logical condition enter the required signal.
3. Display the signals using subplot.

CODE:

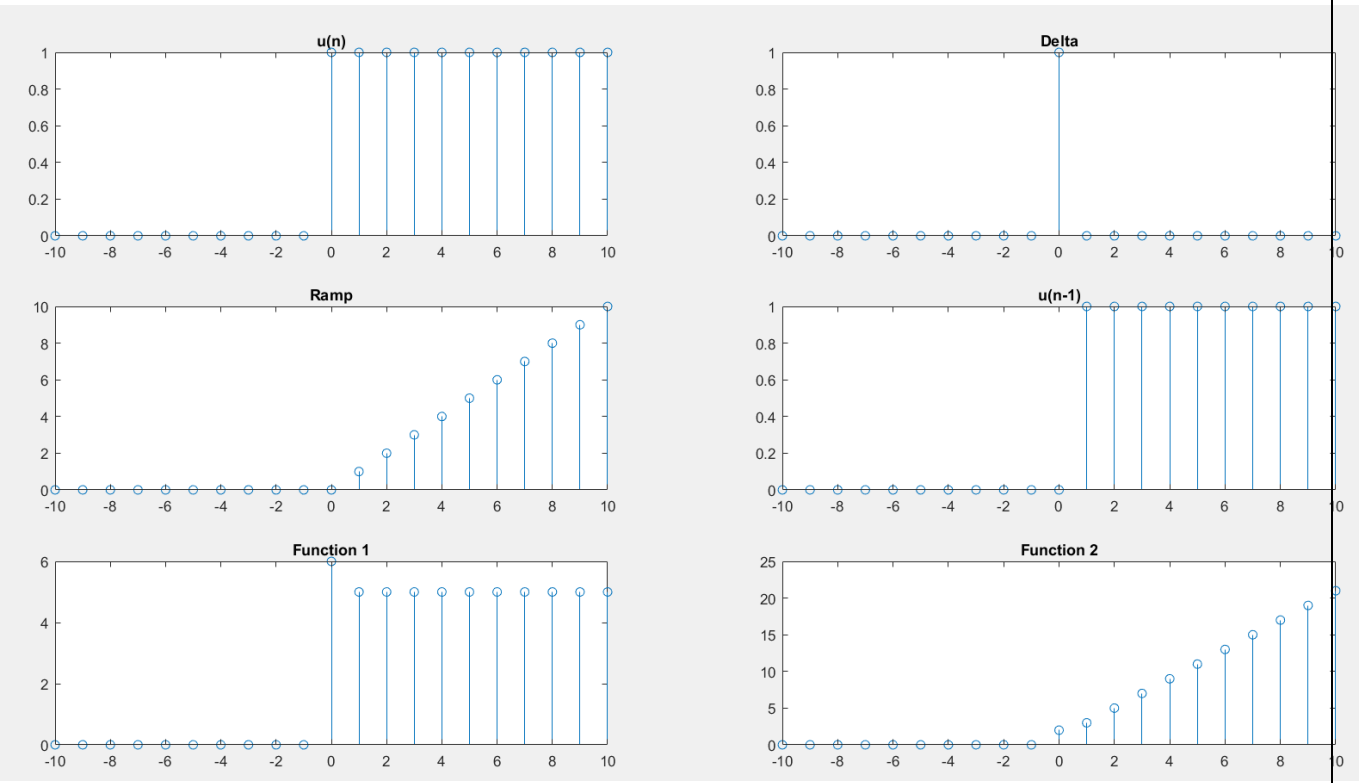
```
n=-10:1:10;
u=[zeros(1,10) ones(1,11)];
del=[zeros(1,10) ones(1,1) zeros(1,10)];
ramp=[zeros(1,10)];
for i=1:11
   ramp(i+10) = i-1;
end
u_1 = u;
u_1(11) = 0;
u3 = 3.*u;
subplot(3,2,1);
stem(n,u);
title('u(n)');
subplot(3,2,2);
stem(n,del)
title('Delta');
subplot(3,2,3);
stem(n,ramp);
title('Ramp');
subplot(3,2,4);
stem(n,u_1);
title('u(n-1)');
fn1 = u + u_1 + u3 + 2.*del;
fn2 = u + 2.*ramp + del;
```

```
subplot(3,2,5);
stem(n,fn1);
title('Function 1');
subplot(3,2,6);
stem(n,fn2);
title('Function 2');
```

MANUAL CALCULATION:



RESULT / INFERENCE:



Hence we can infer that the unit step function, the delta function and the ramp function when combined in a certain sequence with multiple numerical values, produces a signal which has the same result, when simulated and solved analytically.

LAB VERIFICATION:

Lets assume the frequency of square waveform 50Hz with an amplitude of 2 volt peak to oak and offset 0.5V. Lets also assume frequency of sin() signal is 5kHz with amplitude of 3V peak to peak and no just Using subplots, show all 3 graphs.

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Q. Using the MatLab generate the following sequence and verify using manual calculations

a. $u(n) + u(n-1) + 3u(n) + 2\delta(n)$

b. $u(n) + 2\delta(n) + \delta(n)$.

THANK YOU.