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HW5

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Q 2

Clear recent data

```
clc;
close all;
clear;
```

Initialization

```
clear;
clc;
%b = input('Enter the Bit stream \n '); %b = [0,1,1,0,0,1,0,1];
m = [0,1,1,0,0,1,0,1];
n = length(m);
fs = 1e3;
t = 0 : 1/fs : n; %time
x = 1 : 1 : (n+2)*fs; %index
for i = 1 :n
    if (m(i) == 0)
        b_p(i) = -1;
    else
        b_p(i) = 1;
    end
end
```

```

    for j = i:.1:i+1
        m(x(i*fs:(i+1)*fs)) = b_p(i);
        if (mod(i,2) == 0)
            mQ(x(i*fs:(i+1)*fs)) = b_p(i);
            mQ(x((i+1)*fs:(i+2)*fs)) = b_p(i);
        else
            mI(x(i*fs:(i+1)*fs)) = b_p(i);
            mI(x((i+1)*fs:(i+2)*fs)) = b_p(i);
        end
        if (mod(n,2)~= 0)
            mQ(x(n*fs:(n+1)*fs)) = -1;
            mQ(x((n+1)*fs:(n+2)*fs)) = -1;
        end
    end
end
end

```

Remake

```

m = m(fs:end);
mI = mI(fs:(n+1)*fs);
mQ = mQ(2*fs:(n+2)*fs);

```

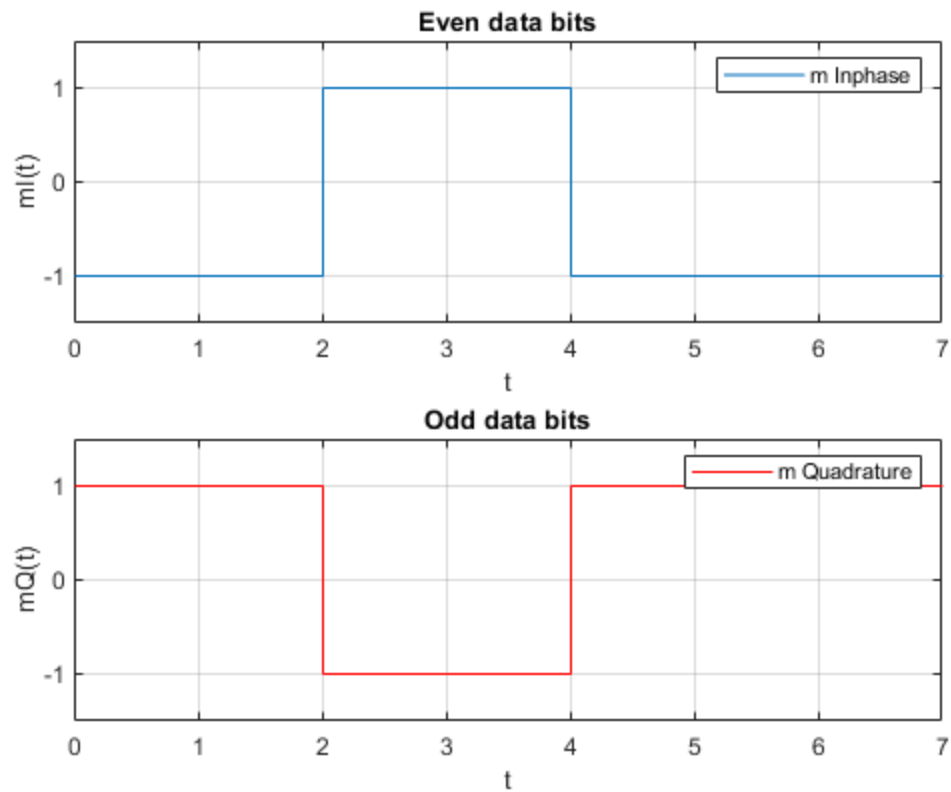
Plotting

```

figure(1)
subplot(211)
stairs(t,mI)
title("Even data bits")
axis([0 7 -1.5 1.5])
xlabel ('t')
ylabel('mI(t)')
grid on
legend('m Inphase')

subplot(212)
stairs(t,mQ,"r")
title("Odd data bits")
axis([0 7 -1.5 1.5])
xlabel ('t')
ylabel('mQ(t)')
grid on
legend('m Quadrature')

```



Modulator

```

fc = 1/8; %carrier frequency MHz with Nyquist rate
T = 8; %micro seceond
clc;
a = cos(2*pi*fc.*t) .* cos((pi.*t)/(2*T));
fH = fc + 1/(4*T);
fL = fc - 1/(4*T);
deltaf = fH - fL ;
x1 = bandpass(a,[fH-deltaf fH+deltaf],fs);
y1 = bandpass(a,[fL-deltaf fL+deltaf],fs);

```

Second part

```

xt = -x1 + y1 ; %after summation
yt = x1 + y1;

clc;

XtxI = xt.*mI ;
YtxQ = yt.*mQ;

Smsk = XtxI + YtxQ; %Smsk(t)

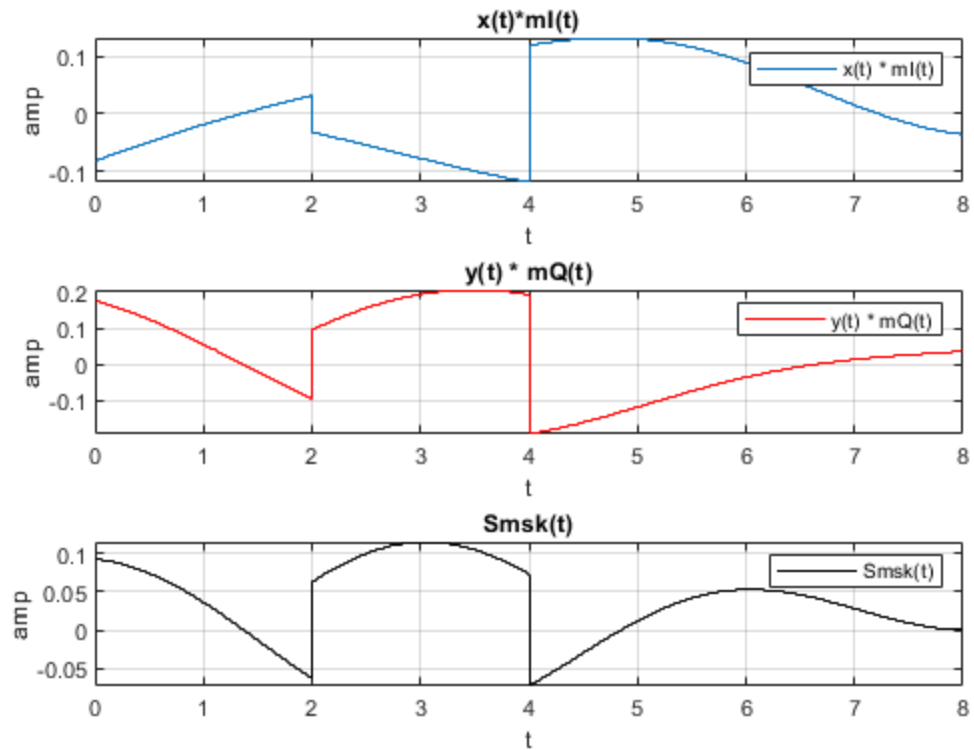
```

Plotting

```
figure(2)
subplot(311)
stairs(t,XtxI)
title("x(t)*mI(t)")
%axis([0 7 -1.5 1.5])
xlabel ('t')
ylabel('amp')
grid on
legend('x(t) * mI(t)')

subplot(312)
stairs(t,YtxQ,"r")
title("y(t) * mQ(t)")
%axis([0 7 -1.5 1.5])
xlabel ('t')
ylabel('amp')
grid on
legend('y(t) * mQ(t)')

subplot(313)
stairs(t,Smsk,"-k")
title("Smsk(t)")
%axis([0 7 -1.5 1.5])
xlabel ('t')
ylabel('amp')
grid on
legend('Smsk(t)')
```



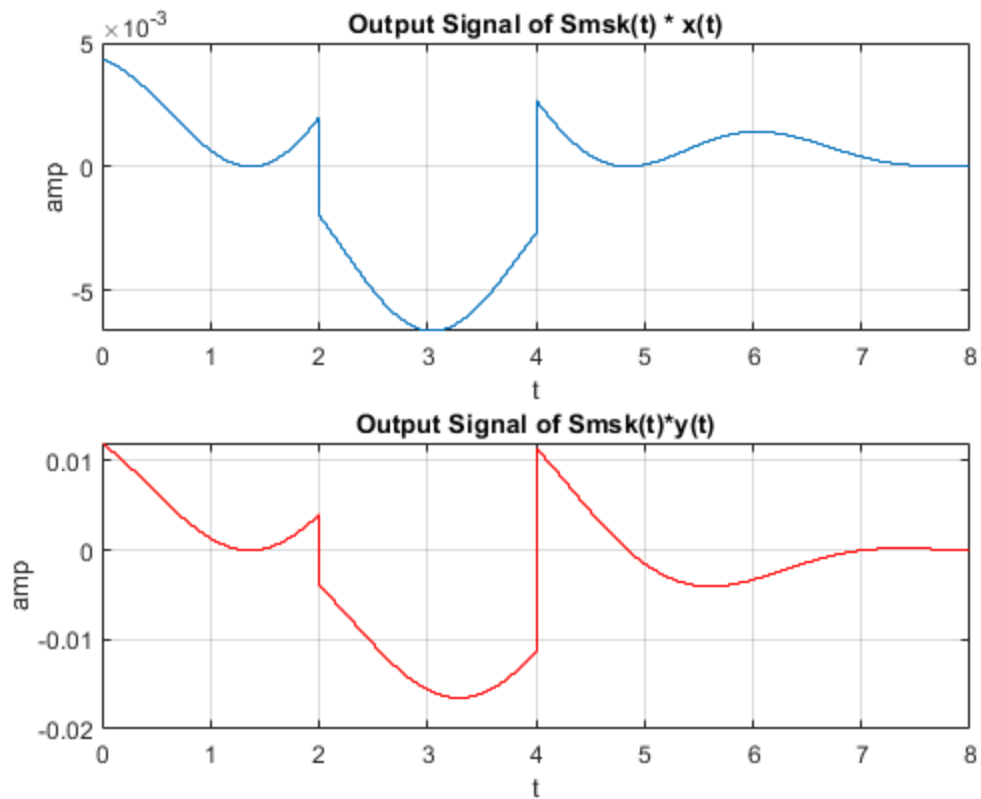
Reciever

```
clc;
S_rI = Smsk .*x1 ;
S_rQ = Smsk .* y1;
```

Plotting

```
clc;
figure(2)
subplot(211)
stairs(t,S_rI)
title("Output Signal of Smsk(t) * x(t)")
%axis([0 7 -1.5 1.5])
xlabel ('t')
ylabel('amp')
grid on

subplot(212)
stairs(t,S_rQ,"-r")
title("Output Signal of Smsk(t)*y(t)")
%axis([0 7 -1.5 1.5])
xlabel ('t')
ylabel('amp')
grid on
```



```

t0 = 1;
t1 = 1;
% Integrator
OutI = cumtrapz(S_rI);
OutQ = cumtrapz(S_rQ);
t1 = 1 : 2*T : length(t) ;
OutDecI =OutI(t1);
OutDecQ = OutQ(t1);

```

Decision

Plotting

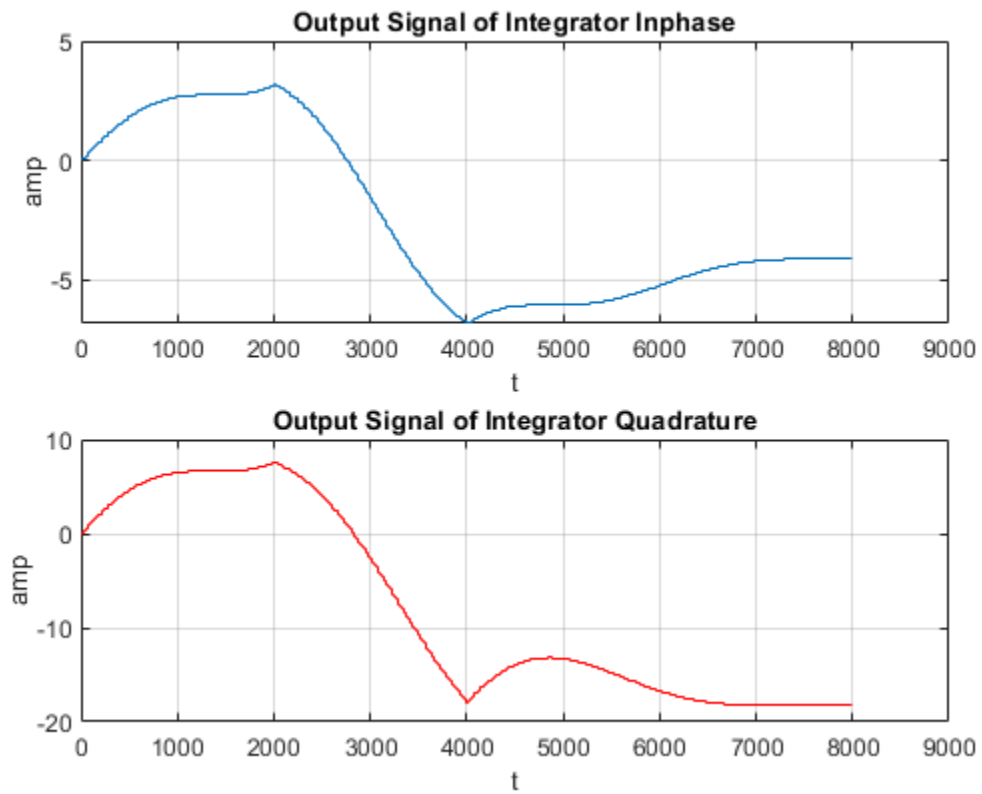
```

clc;
figure(4)
subplot(211)
stairs(t1,OutDecI)
title("Output Signal of Integrator Inphase")
%axis([0 7 -1.5 1.5])
xlabel ('t')
ylabel('amp')
grid on

subplot(212)
stairs(t1,OutDecQ,"r")

```

```
title("Output Signal of Integrator Quadrature")
%axis([0 7 -1.5 1.5])
xlabel('t')
ylabel('amp')
grid on
```



Published with MATLAB® R2020b