EXPT No. 06

Aim: Generation and detection of Binary frequency shift keying BFSK

Title: To Generate and detect Binary frequency shift keying BFSK signal.

Software: Scilab open source.

Theory:

Generation of FSK:

Frequency-shift keying (FSK) is a frequency modulation scheme in which digital information is transmitted through discrete frequency changes of a carrier wave. The simplest FSK is binary FSK (BFSK). BFSK uses a pair of discrete frequencies to transmit binary (0s and 1s) information. With this scheme, the "1" is called the mark frequency and the "0" is called the space frequency.

In binary FSK system, symbol 1 & 0 are distinguished from each other by transmitting one of the two sinusoidal waves that differ in frequency by a fixed amount.

Si (t) = $\sqrt{2E/Tb}$ cos $2\pi f1t$ $\quad 0 \le t \le Tb$

0 $\quad$ elsewhere

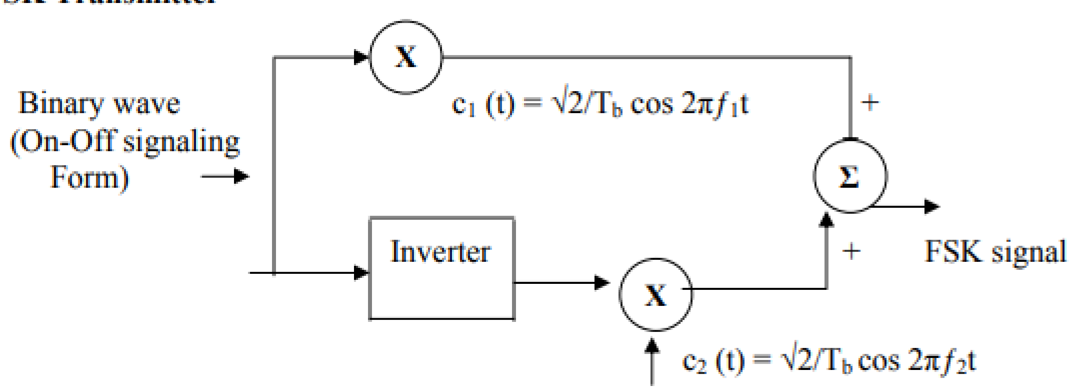
Where i=1, 2 & Eb=Transmitted energy/bit

Transmitted freq= fi = (nc+i)/Tb, and n = constant (integer), Tb = bit interval

Symbol 1 is represented by S1 (t)

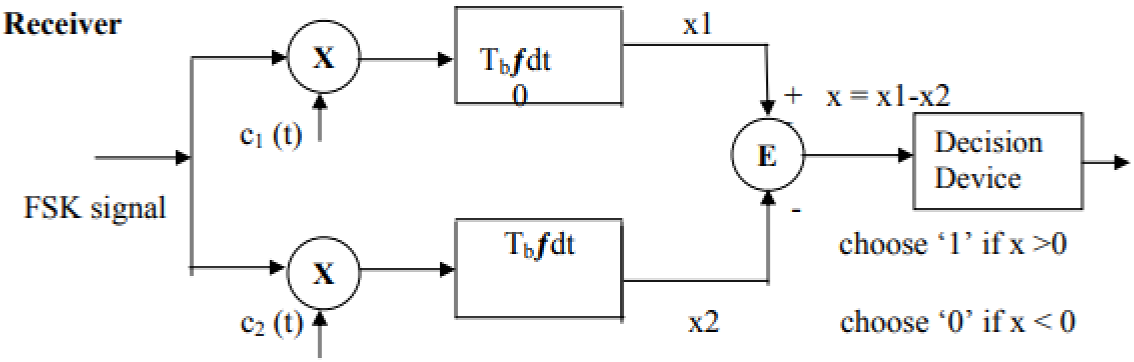
Symbol 0 is represented by S0 (t)

BFSK Transmitter



The input binary sequence is represented in its ON-OFF form, with symbol 1 represented by constant amplitude of $\sqrt{Eb}$ with & symbol 0 represented by zero volts. By using inverter in the lower channel, we in effect make sure that when symbol 1is at the input, The two frequency f1& f2 are chosen to be equal integer multiples of the bit rate 1/Tb. By summing the upper & lower channel outputs, we get BFSK signal.

BFSK Receiver



The receiver consists of two correlators with common inputs which are supplied with locally generated coherent reference signals c1(t) and c2 (t). The correlator outputs are then subtracted one from the other, and the resulting difference x is compared with a threshold of zero volts. If x >0, the receiver decides in favour of symbol 1 and if x <0, the receiver decides in favour of symbol 0.

Algorithm

Initialization commands

FSK modulation

1. Generate two carrier's signals.
2. Start loop
3. Generate binary data, message signal and inverted message signal
4. Multiply carrier 1 with message signal and carrier 2 with inverted message signal
5. Perform addition to get the FSK modulated signal
6. Plot message signal and FSK modulated signal.
7. End loop.
8. Plot the binary data and carriers.

FSK demodulation

1. Start loop
2. Perform correlation of FSK modulated signal with carrier 1 and carrier 2 to get two decision variables x1 and x2.
3. Make decisionon x = x1-x2 to get demodulated binary data. If x>0, choose '1' else choose '0'.
4. Plot the demodulated binary data.

Conclusion:

The program for FSK modulation and demodulation has been simulated in SCILAB and necessary graphs are plotted.

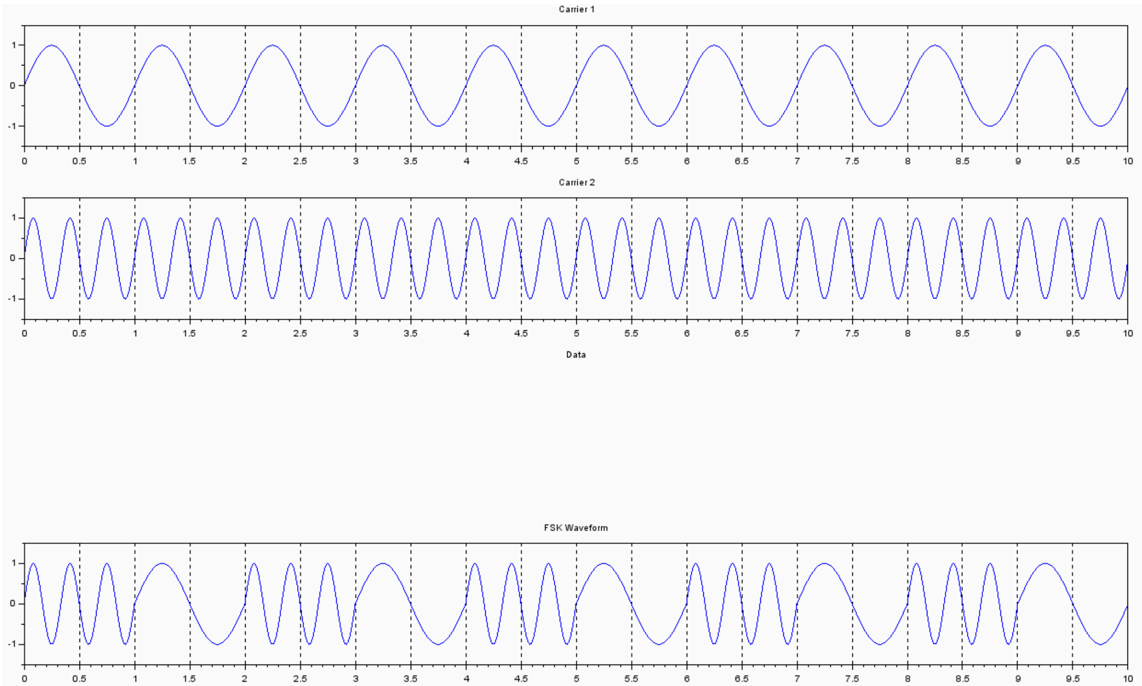
CODE OF FSK USING SCILAB:

```
clear;

clc;

close;

t=0:0.01:1;

f1=1;

f2=3;

I=[1,0,1,0,1,0,1,0,1,0];

z=0;

for n=1:length(I)

   subplot(4,1,1)

   a=gca();

   a.data_bounds=[0,-1.5;length(I),1.5];

   a.x_location="bottom";

   a.grid=[1,-1];

   title('Carrier 1')

      plot((t+z),sin(2*%pi*f1*t));


   subplot(4,1,2)

   a=gca();

   a.data_bounds=[0,-1.5;length(I),1.5];

   a.x_location="bottom";

   a.grid=[1,-1];

   title('Carrier 2')

      plot((t+z),sin(2*%pi*f2*t));

   subplot(4,1,3)

   a=gca();

   a.data_bounds=[0,-1.5;length(I),1.5];
```

```
    a.x_location="bottom";

    a.grid=[1,-1];

    title('Binary Data')

        plot((t+z),I(n));

    subplot(4,1,4)

    a=gca();

    a.data_bounds=[0,-1.5;length(I),1.5];

    a.x_location="bottom";

    a.grid=[1,-1];

    title('FSK Waveform')

     if (I(n)==0)

        plot((t+z),sin(2*%pi*f1*t));

     elseif (I(n)==1)

         plot((t+z),sin(2*%pi*f2*t));

    end

   z=z+1;

end
```

OUTPUT:

I=[1,0,1,0,1,0,1,0,1,0]



I=[0,1,0,1,0,1,0,1,0,1]