Experiment–4

Aim:

To study and generate frequency modulation and demodulation using MATLAB.

Description:

MATLAB software with essential configurations.

Theory:

Frequency modulation is a technique or a process of encoding information on a particular signal (analogue or digital) by varying the carrier wave frequency in accordance with the frequency of the modulating signal. If we observe the graph, we can notice that the frequency of a carrier increases when the amplitude of the input signal is increased. Here, the carrier frequency is maximum when the input signal is at its highest. Also, the frequency of a carrier decreases if the amplitude of the modulating signal goes down. What it means is that the carrier frequency is minimum when the input signal is at its lowest. On the other line of spectrum, after the successful modulation recovery of the message signal is another job. When there is modulation, usually , we need to successfully demodulate it and, at the same time, recover the original signal. In such cases, an FM demodulator, also known as an FM discriminator or FM detector, is used. While there are several types of FM demodulators, the main functionality of these devices is to convert the frequency variations of the input signal into amplitude variations of the output signal. The demodulators are used along with an audio amplifier or possibly a digital interface.

Code:

```
1   %fm modulation and demodulation
2   close all
3   clear all
4   clc
5   fs=10000;
6   Am=1;
7   Ac=1;
8   fm=35;
9   fc=500;
10  B=10;
11  t=(0:.1*fs)/fs;
12  wc=2*fc*pi;
13  wm=2*fm*pi;
14  m_t=Am*cos(wm*t);
15  subplot(4,1,1)
16  plot(t,m_t);
17  title('Message Signal m(t)');
18  xlabel('Time (s)');
19  ylabel('Amplitude');
20  c_t=Ac*cos(wc*t);
21  subplot(4,1,2)
```

```
22  plot(t, c_t);
23  title('Carrier Signal c(t)');
24  xlabel('Time (s)');
25  ylabel('Amplitude');
26  s_t=Ac*cos(wc*t + B*sin(wm*t));
27  subplot(4,1,3)
28  plot(t, s_t);
29  title('FM Modulated Signal s(t)');
30  xlabel('Time (s)');
31  ylabel('Amplitude');
32  d=demod(s_t,fc,fs,'fm');
33  subplot(4,1,4)
34  plot(t, d);
35  title('Demodulated Signal d(t)');
36  xlabel('Time (s)');
37  ylabel('Amplitude');
38  sgtitle('Sujal Singh (04119051723)')
```

Output:

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