**Military Institute of Science and Technology**

Department of Computer Science and Engineering

Course Title: Data and Tele- Communication Sessional

Course Code: CSE-318, Cr. Hr: 1.50

Level-3, Term-2

###### Experiment No: 9

##### Name of the Experiment: **FSK Modulation and Demodulation**

##### 

**Objectives:**

The main objectives of this experiment are:

1. To know the technique of digital frequency modulation.
2. To study the characteristics of a signal modulated in frequency in the transmitter and its demodulation in the receiver.

**Required Equipments:**

1. MODICOM 5 Board
2. IC Power 60 unit
3. Set of connection leads
4. Multi meter
5. Oscilloscope

**Theory:**

In FSK, the output of the transmitter changes continually from one frequency to another each time there is a level change in the data signal modulator. If the higher frequency is used to represent the data ‘1’, then the lower frequency for the data ‘0’.

The generation of an FSK signal in the transmitter can be done by two ASK generators. One of them generates the ASK signal with the carrier of the highest frequency and the data to transmit as modulator, and in the other, ASK signal is formed with the smaller frequency carrier and, an inverted signal of the data to transmit as modulator.

The block diagram for generating an FSK signal is represented in the next page:

In the receiver, the FSK signal is decoded by means of a PLL detector. The PLL detects the frequency

Changes of the FSK signal and provides an output voltage proportional to the frequency of the input signal.

The block diagram required to demodulate an FSK signal in the receiver is represented in the following

figure: Modulator Signal (Data):

Adjusting the MODICOM with the DC1, we should obtain the data:

D6…………………..D0

1 0 1 0 1 0 1

The signal we shall use as modulator is that corresponding to the NRZ (L) codification of the said data.





**PART A: FSK MODULATION**

Procedure:

1. Carry out the assembly indicated in the following figure.



1. Using the adjustments GAIN, CARRIER OFFSET and MODULATION OFFSET of the modulators 1 and 2 to generate a signal modulated in FSK of amplitude 2 volts (p-p) that is as close as possible to the ideal. Draw the modulated signal.

**PART B: FSK DEMODULATION**

1. Draw the signal at the following points:
   * At the input of the MODICOM 5/2.
   * AT the output of the FSK demodulator (PLL).
   * At the output of the low pass filter.
   * AT the output of the DATA SQUARING circuit.
2. Carry out the necessary assembly between MODICOM 5/2 and MODICOM 3/2 to recover the digital data signal.
3. Check that the data generated in the MODICOM3/1 are recovered in MODICOM 3/2. For this, set the SYNC CODE GENERATOR switch of the MODICOM 3/1 to ON.

Report:

1. Submit all the wave shapes you observed at different test points, with your report. Discuss the nature of the wave shapes at different output levels. (Wave shapes should be plotted on graph paper)
2. What do you mean by FSK modulation and demodulation?
3. Briefly discuss the coherent and non-coherent detection of the FSK modulated signal. Which method is advantageous when considering the noise effect?
4. When it is to be required to obtain the lowest probability of bit error when AWGN corrupts the received FSK signal, what should be performed?
5. What is the function of a Low Pass Filter (LPF) on coherent detection?

References:

1. MODICOM 5 manual.
2. Modern Digital and Analog Communication Systems. -- B. P. Lathi
3. Communication Systems. -- Simon Haykin
4. Modern Communication Systems- Principles and Applications. -- Leon W. Couch II