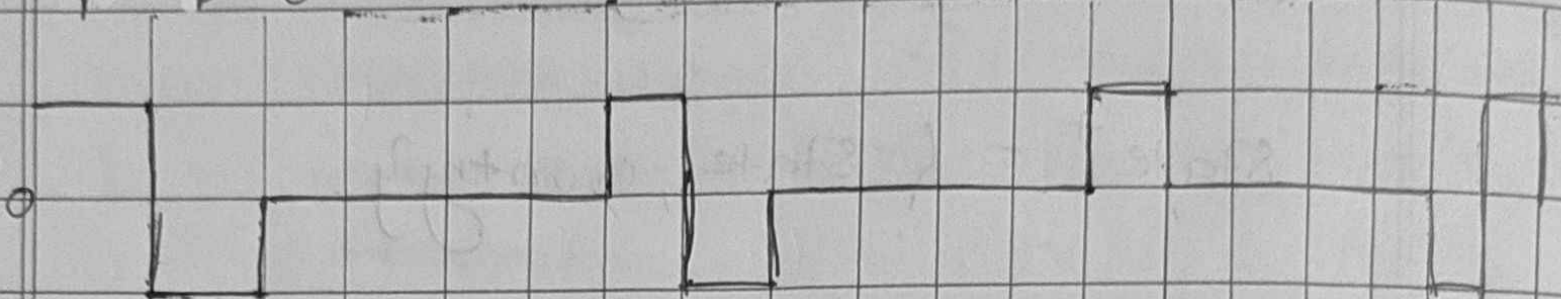


## DCOM Tutorial 3

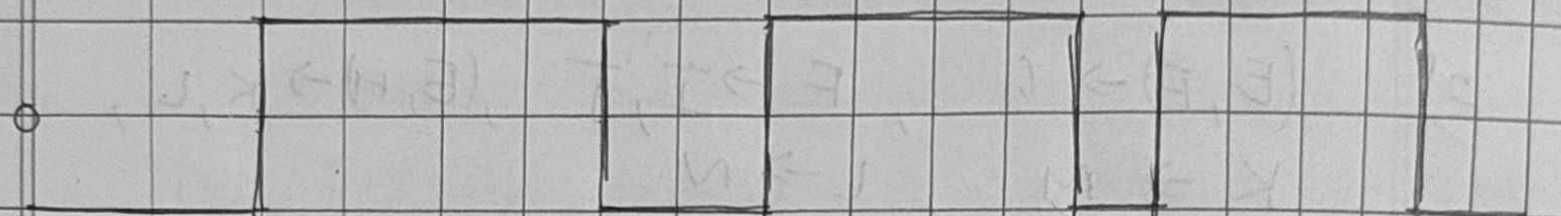
Chap 4

1) 1 0 0 0 0 1 1 0 0 0 0 1 0 0 0 0 1 1

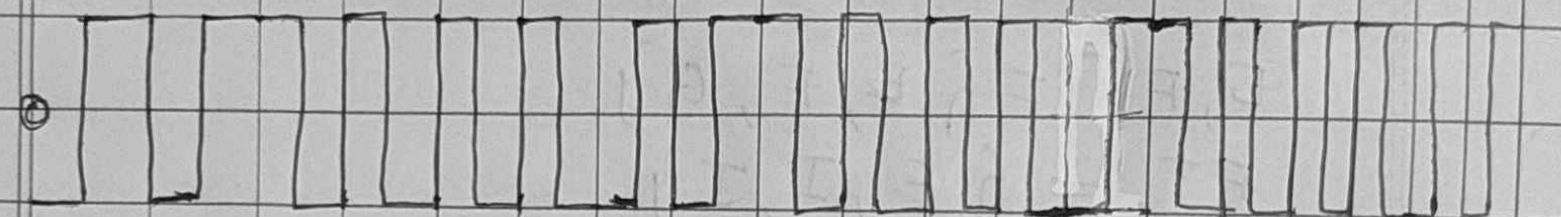
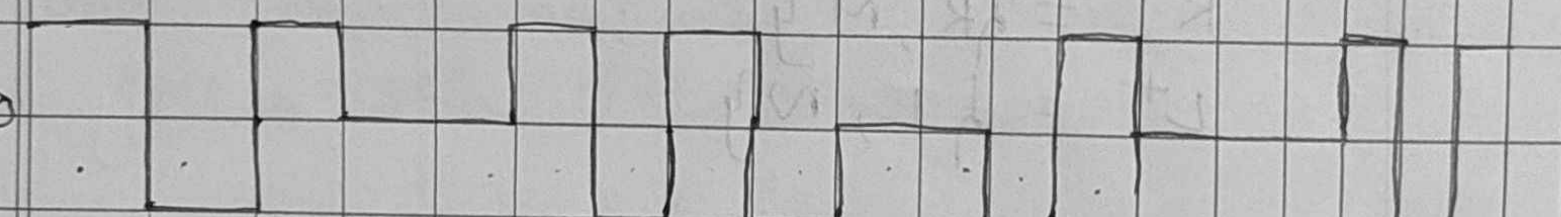
AMI →



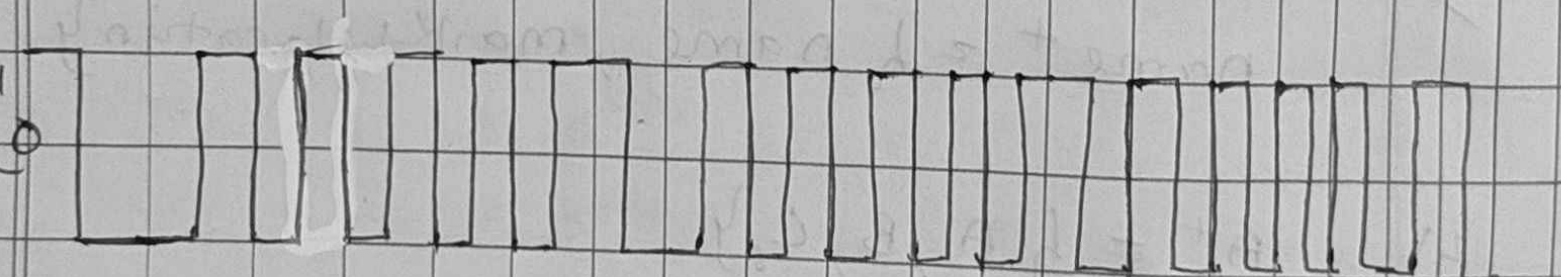
NRZ-L



Manchester

HDB<sub>3</sub>

Differential manchester



2. List the steps that take an analog signal to a PCM digital signal code.

→ a) Sampling:- Analog signal is sampled for every  $T_s$  second. with sampling rate  $f_s = \frac{1}{T_s}$  ( $T_s$  = same period)

b) Quantization :- Representing the sampled ~~various~~ values of the amplitude by a finite set of <sup>levels</sup> ~~values~~.

$D = (V_{\max} - V_{\min}) / L$  and assign

quantized value of 0 to  $(L-1)$  to midpoint of each zone

c) Encoding :- The last step is PCM encoding. After each sample is quantized & the no. of bits per sample is decided, each sample can be changed to an  $n_b$  bit code word.

$$\text{Bit rate} = \text{Sampling rate} \times \text{no. of bits} \\ = f_s \times n_b$$

3) Difference between serial & parallel transmission

Serial	Parallel
--------	----------

i) It sends data bits one after the another over a signal channel. i) It sends multiple data bit at the same time over multiple channel.

ii) The order of data bits is important. ii) The order of data bits is not important.

iii) It is not easy to program. iii) It is easier to program.

iv) This is slower than parallel. iv) This is faster than serial.

4) Difference between baud rate and bit rate.



→

bit rate

baud rate

i) Focuses on computer efficiency      i) Focuses on data transmission efficiency

ii) no. of bits/sec

ii) no. of signal units/sec

iii) Bit rate = baud rate  
× no. of bits  
per sec

iii) Baud rate = bit rate / no. of bits  
per sec

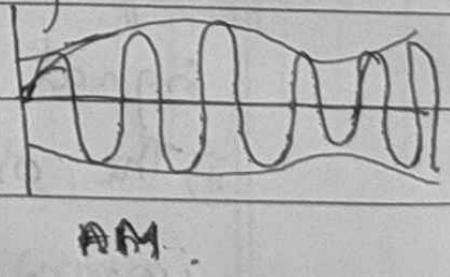
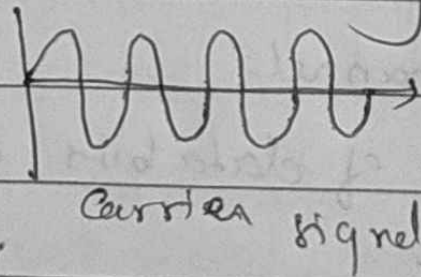
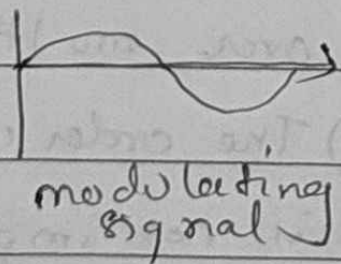
Chap 5

1) Explain methods for analog to analog conversion (AM, FM, PM)

→

Amplitude modulation:-

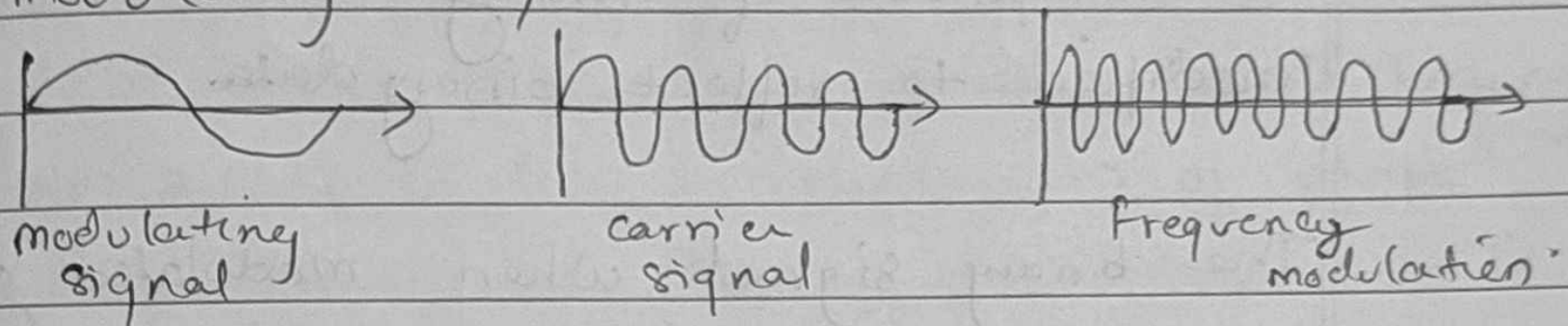
The modulation in which the amplitude of the carrier wave is varied according to the instantaneous amplitude of the modulating signal keeping phase and frequency as constant. AM is normally implemented by using a simple multiplier because the amplitude of the carrier signal needs to be changed according to the amplitude of the modulating signal.

Frequency modulation:-

The modulation in which the frequency of the carrier wave is varied according to the instantaneous amplitude of the modulating signal keeping

phase and amplitude as constant.

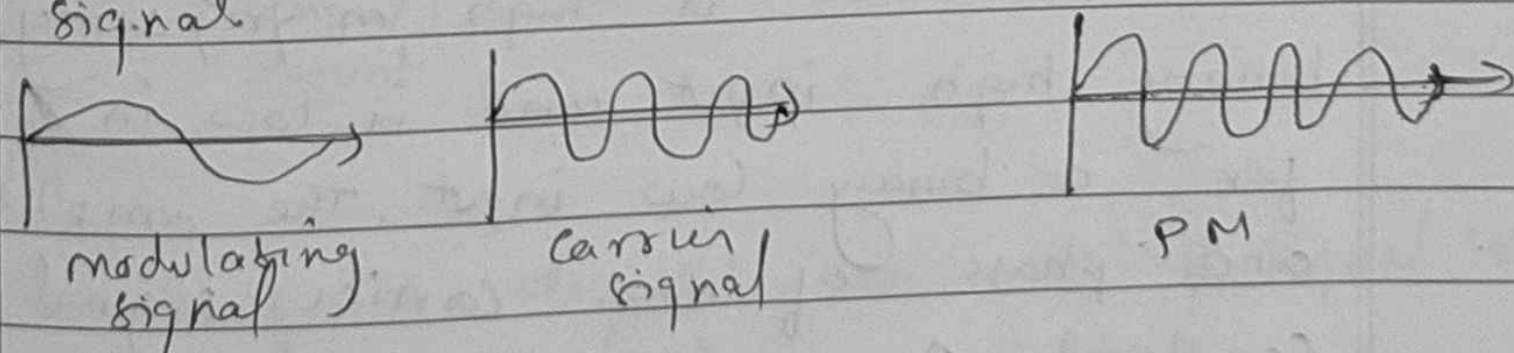
FM is normally implemented by using a voltage controlled oscillator as with FSK. The frequency of the oscillator changes according to the input voltage which is the amplitude of the modulating signal.



### Phase modulation:

The modulation in which the phase of the carrier wave is varied according to the instantaneous amplitude of the modulating signal keeping amplitude and frequency as constant.

PM is normally implemented by using a voltage controlled oscillator along with a derivative. The frequency of the oscillator changes according to the derivative of the input voltage which is the amplitude of the modulating signal.



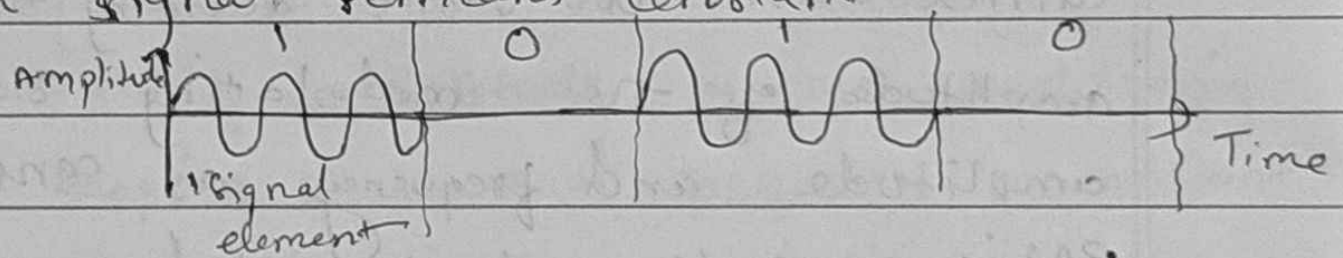


2) Explain three methods of converting digital data to analog signal.

→ Amplitude Shift Keying (ASK)

It is a technique in which carrier signal is analog and data to be modulated is digital. The amplitude of analog carrier signal is modified to reflect binary data.

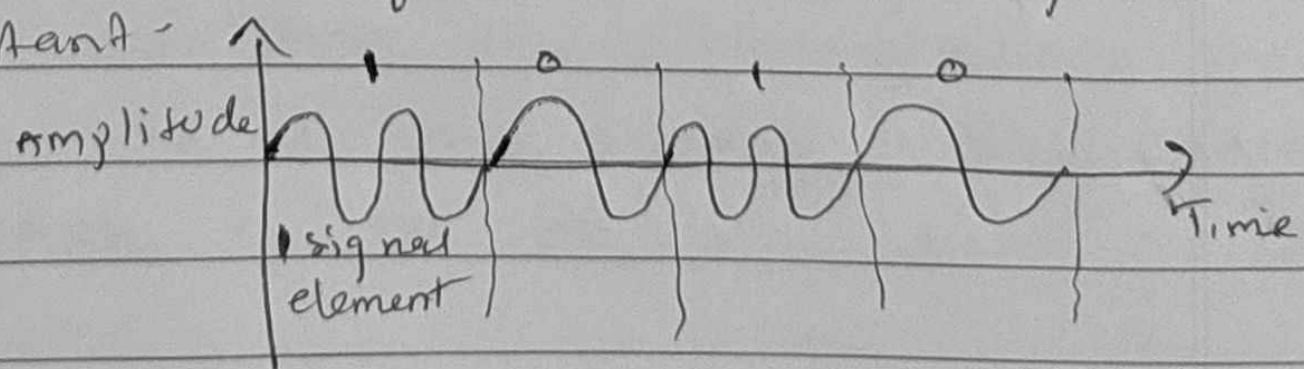
The binary signal when modulated gives a zero value when the binary data represents 0 while gives the carrier output when data is 1. The frequency and phase of the carrier signal remains constant.



Frequency Shift Keying (FSK)

In this modulation, the frequency of analog carrier is modified to reflect binary data.

The output of frequency shift keying modulated wave is high in frequency for a binary high input and is low in frequency for a binary low input. The amplitude and phase of the carrier signal remains constant.



## Phase Shift Keying (PSK)

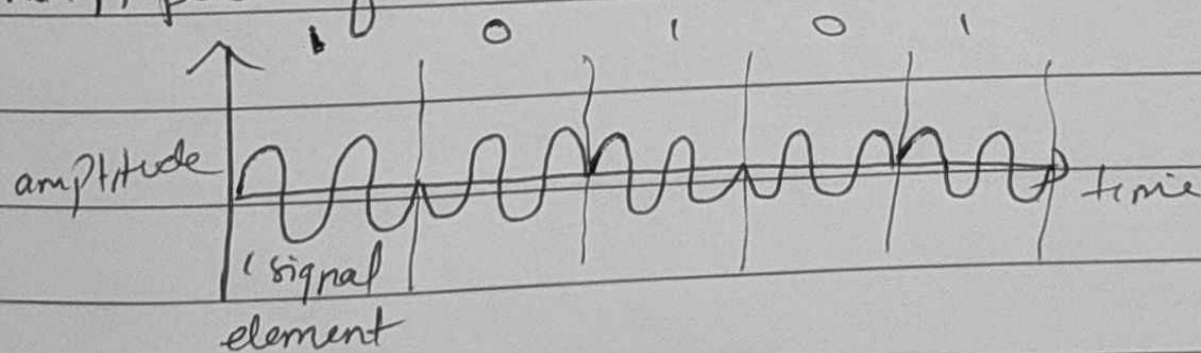
In this modulation, the phase of the analog signal is modified to reflect binary data. The amplitude and frequency of the carrier signal remains constant.

### i) <sup>Phase</sup> Binary Shift Keying (BPSK)

BPSK is also known as phase reversal keying or 2PSK. It is the simplest form of phase shift keying. The phase of the carrier wave is changed according to the two binary inputs. In Binary Phase Shift Keying, difference of  $180^\circ$  phase shift is used between binary 1 and binary 0.

### ii) Quadratic phase shift keying (QPSK)

This technique is used to increase the bit rate i.e., we can code two bits onto one signal element. It uses four phases ~~phases~~ to encode two bits per symbol. QPSK uses phase shifts of multiples of  $90^\circ$ .



3) Which of the digital to analog signal techniques is susceptible to noise?

→ Amplitude Shift Keying is more susceptible to noise as amplitude is more affected by noise than frequency or phase.



4) Write a short note on frequency modulation.

→ Frequency modulation is a technique or a process of encoding information on a particular signal (analog or digital) by varying the carrier wave frequency according to the frequency of the modulating signal.

The peak amplitude and phase of the carrier signal remain constant. The total band width required for FM can be determined from the band width of audio signal,  $B_{FM} = 2(I + \beta)B$ .

