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Subject: DATA COMMUNICATION AND NETWORK

Q-NO-1(a)

Solution::

To multiplex 10 voice channels, we need nine (9) guards bands. And they required bandwidth is :

then

$$B = (4kHz) \times 10 + (500Hz) \times 9 = 44.5\,kHz$$

Q-NO-1(b)

Solution::

An analog signal carries 4bits per signal element.

If 3000 signal elements are send per second, find the bit rate?

$$N = S * r$$

$$= 3000 * 4 = 12000$$

$$N = 12000 \text{ bps}$$

Q-NO - 1(c)

Signal Element and data Element:

A data element is the smallest entity that represent a piece of information (a bit). A signal element is the shortest unit of a digital signal Data Elements are what we need to send; Signal element are what we can send. Dat element are being carried, Signal elements are the carriers.

Q-NO - 1(d)

A Link and a channel in multiplexing:

In multiplexing, the word link refers to the physical path. The word channel refers to the portion of a link that carries a transmission between a given pairs of

lines. One link can have many (n) channels.

Q-NO-1(e)

List three different techniques in Serial transmission.

Serial transmission plays a vital role in data transmission. It transfers bit by bit.

Three different techniques in serial transmission are:

(i) Asynchronous - In this, we send 1 start bit at the begining and 1 or more stop bits at the end of each byte i.e irregular intervals.

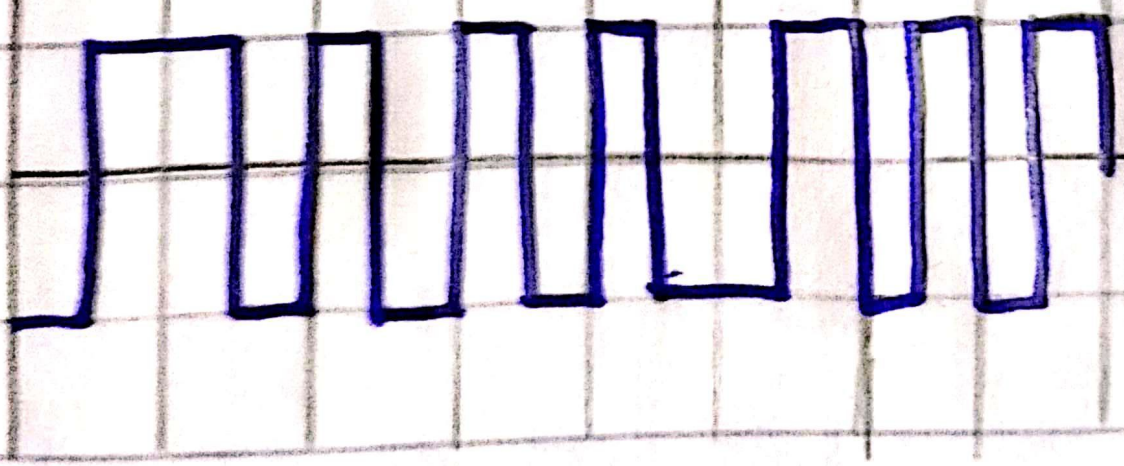
(ii) Synchronous - In this, we send bits in a serial order with out any gaps, i.e regular intervals

(iii) Isynchrounous - It sends a block of data asynchronously.

Q-NO-2(a)

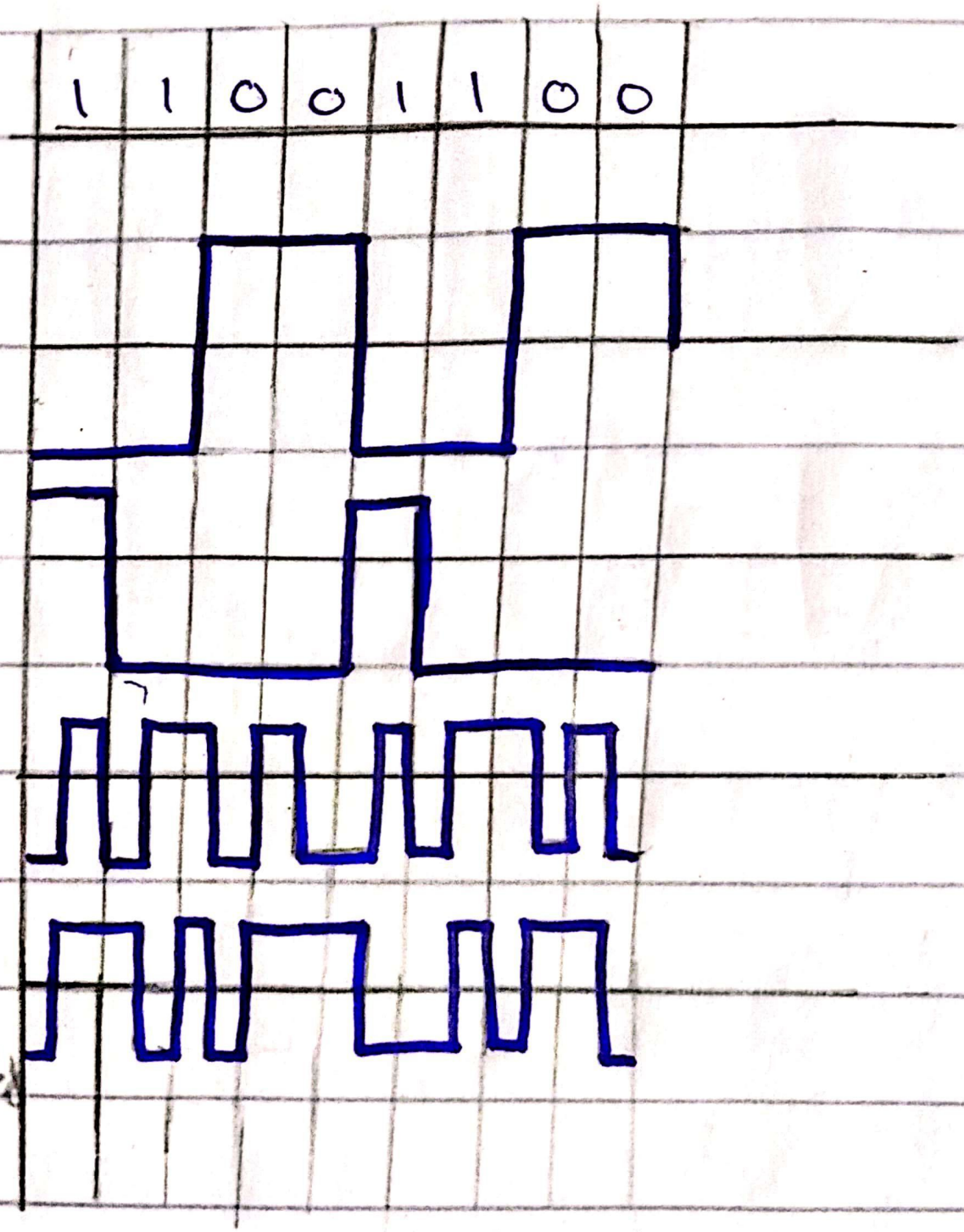
Solution:

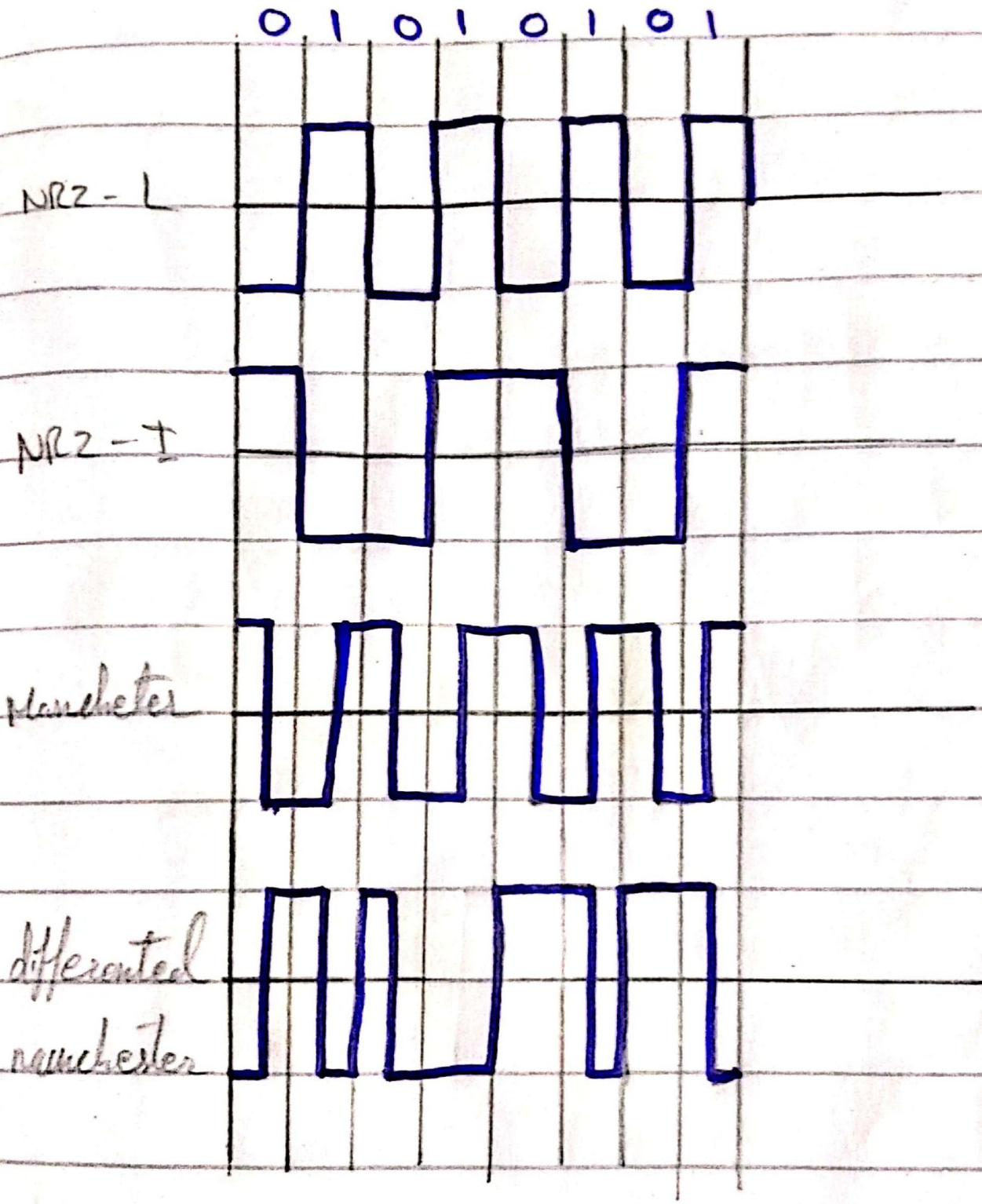
1 0 0 0 0 1 1 1



Q-NO-2(b)

Ans:





Q-NO-2c

Solution:

Bandwidth = High frequency - low frequency

$$950\,kHz = x - 450\,kHz$$

$$x = 950 + 450 = 1400\,kHz$$

Nyquist Sampling Rate => should be at least twice the maximum frequency

Hence

Nyquist Sampling Rate = $2^* \times 1400\,kHz = 2800\,kHz$

Q-No-3(a)

Solution::

The middle of the bandwidth is located at 650KHz. This mean that our carries frequency can be at $f_c = 650\ kHz$

We can use the formula for Bandwidth to find the bit rate with d = 1

R 300 kHz

500 to 800 kHz

$B = (1+d) \times S$

$B = 2S$

$B = 2(N \times 1/8)$

$B = 2(N)$

$300 = 2N$ $\quad N = 2/300$

$N = 150kbs$

Q.No-3(b)

Binary Amplitude Shift Keying:

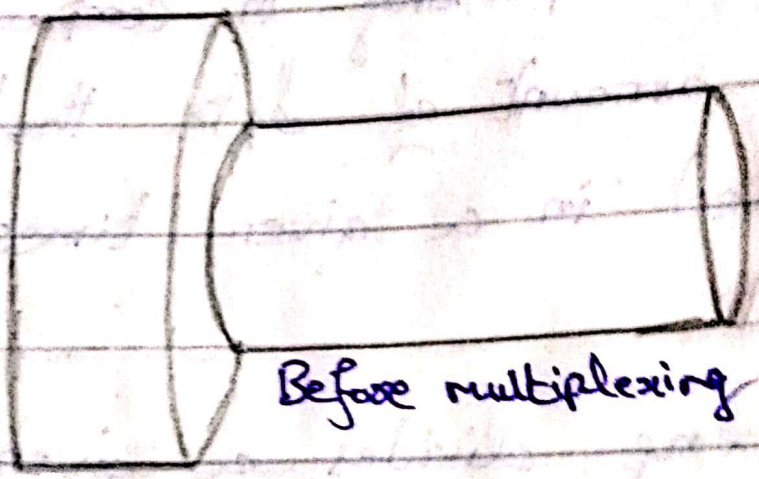
* Although we can have several levels of signal elements, each with a different amplitude, Ask is normally implemented using only two levels.
* This is referred to as binary amplitude shift keying or on-off keying.
* The peak amplitude of one signal level is 0; the other is the same as the amplitude of the carriers frequency.

Q-NO-4(a)

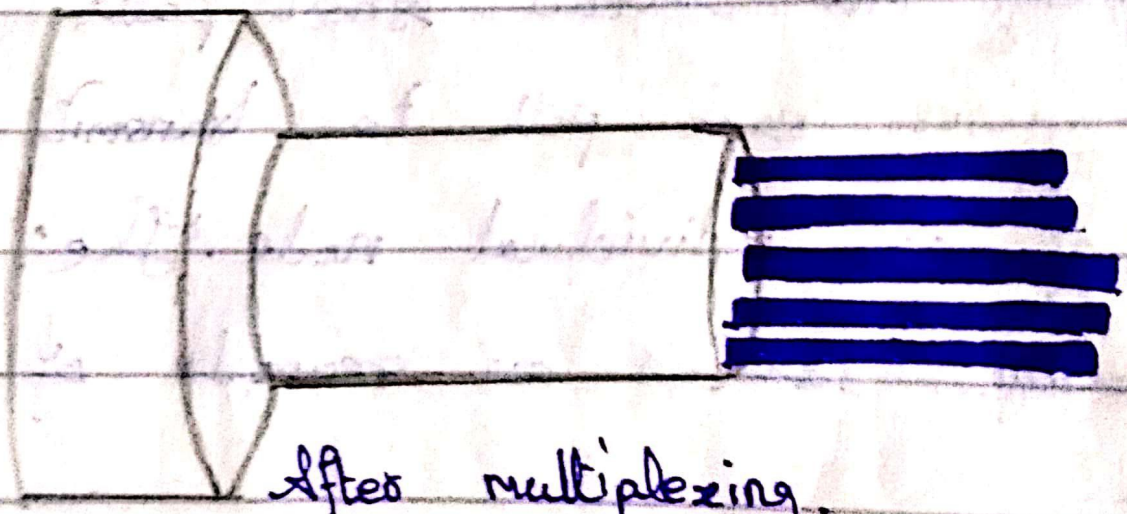
Multiplexing And Demultiplexing::

Multiplexing is a process that allows multiple signals to travel simultaneously over a single communication channel or path. Multiplexing in computer network increases amount of data that can be transmitted in a given timespan over a bandwidth

Multiplexing divides a given path logically into several short paths and then uses each path to transmit the data of an individual node. The following image shows an example of the concept.



Before multiplexing



After multiplexing.

In multiplexing, two devices are mainly used; a multiplexer and demultiplexer. Both devices work on both ends of the path. A multiplexer works on the transmitting side and a demultiplexer works on the receiving side. The Demultiplexer separates all the signals and passes them to their respective nodes.

(TDM) Time Division Multiplexing::

In this technique, time intervals are used to merge signals. The multiplexer creates time-slots equal to the number of sending nodes and then assigns a separate time slot to each node. Each node can send data only in its designated time-slot. If nodes has no data to send, its sends nothing in its time-slot. If a node has more data to send, it must have to wait till the next time-slot.

(FDM) Frequency Division Multiplexing::

The multiplexing technique is used in analog communication. This technique work in two steps. In the first step, it divides the communication channel into sub-channels and assigns a seperate to each node.

In the second step, it modulates the frequency of carries wave of each node

Q-NO-4(b)

Analog to Analog Conversion::

is a process by virtue of which a characteristic of carried wave is varied according to the instantaneous amplitude of the modulating signal. This modulation is generally needed when a bandpass channel is required. Bandpass is a range of frequencies which are transmitted through

a bandpass filter - which is a filter allowing specific frequencies to pass preventing signals at unwanted frequencies.

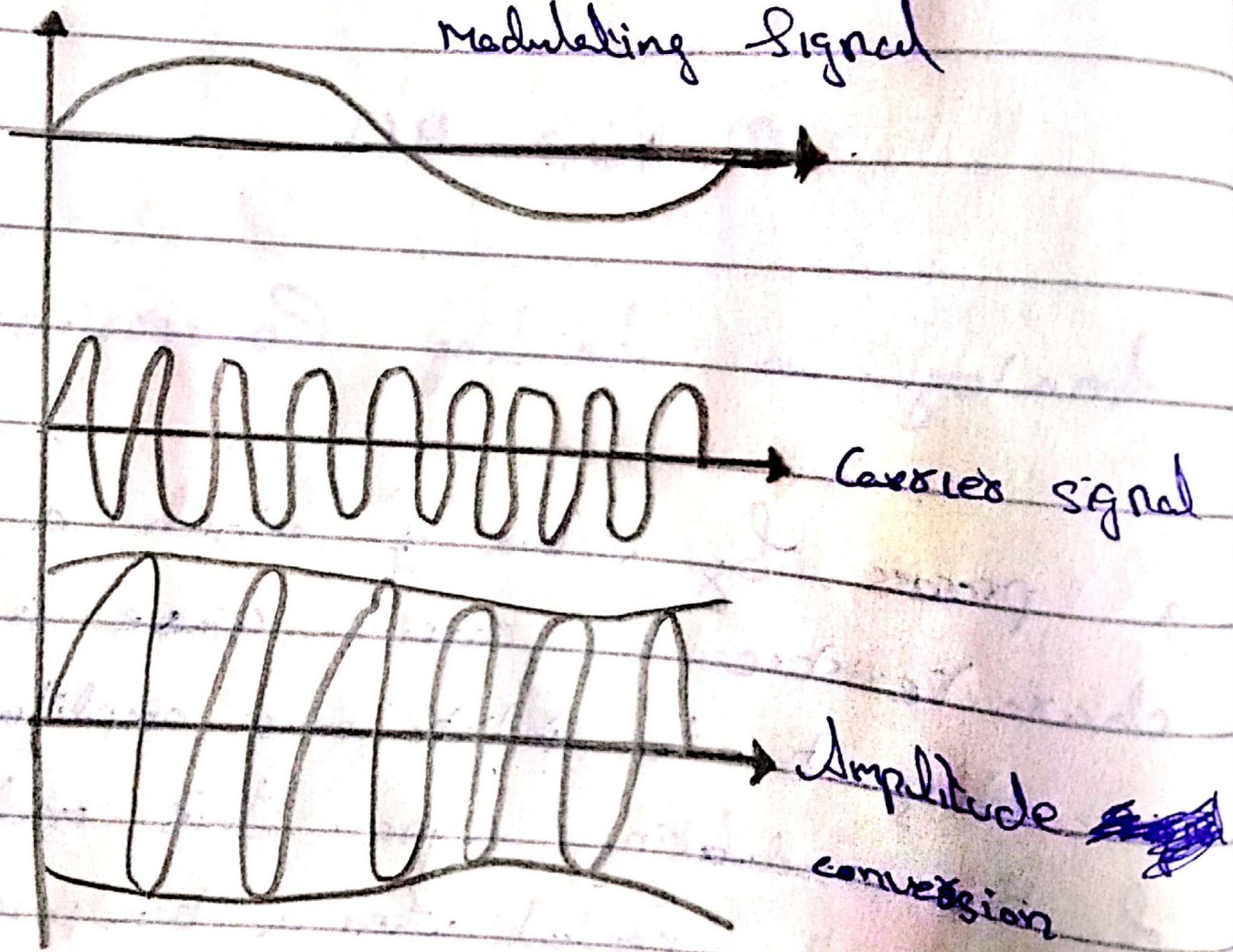
Analog to Analog conversion can be done in three ways:

* Amplitude Modulation or conversion
* Frequency Modulation
* Phase modulation

(i) AMPLITUDE MODULATION::

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

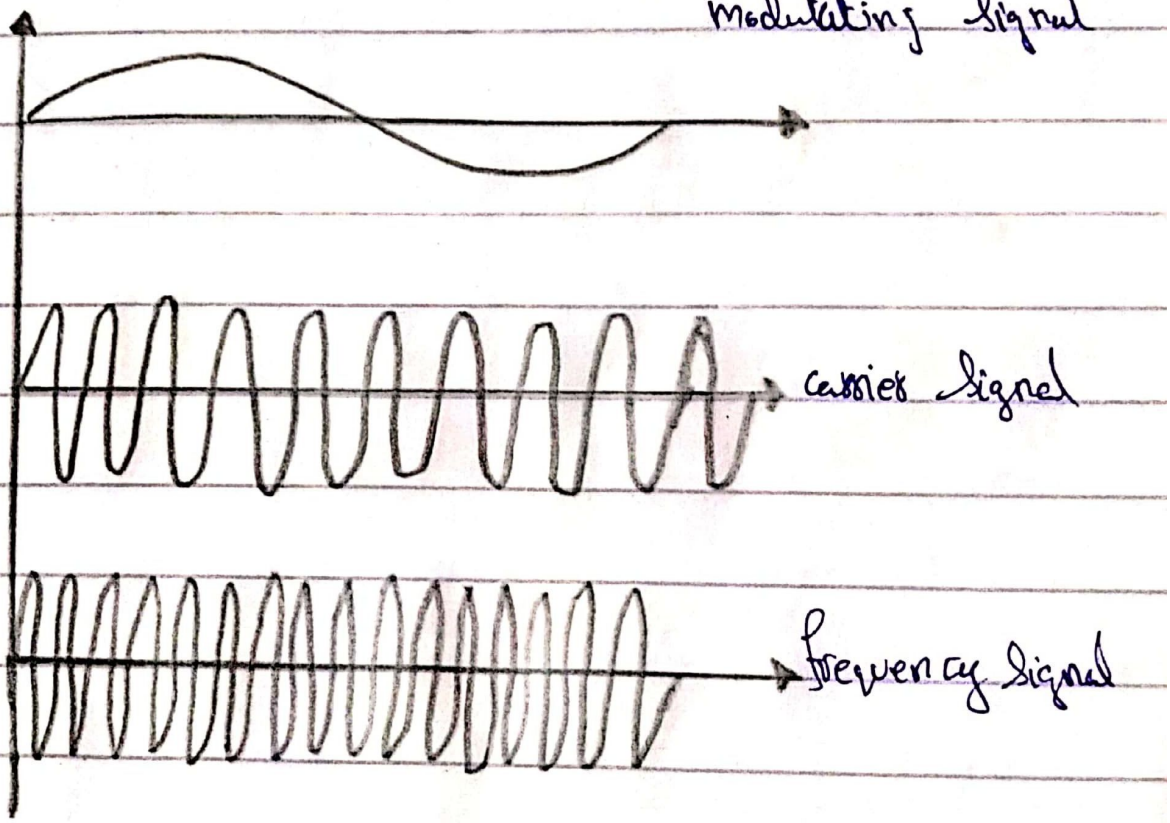
Concept of amplitude:-



(ii) FREQUENCY MODULATION:-

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

Concept of frequency modulation:-



(iii) PHASE MODULATION:-

in which the phase of the carrier wave is varied according to the amplitude of the modulating signal keeping amplitude and

frequency is constant.

Concept of Phase modulation: