DATA COMM & NETWORK

·FINALS·

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·Q NO 1·

(a)

DATA :

Bwidth = 4KHz = 4000Hz,
Voice channels = 10,
Guard band = 500 Hz,

SOL :

To multiplex 10 voice channel 9 Guard bands are needed.
So, the required bandwidth is,

$$B = (4000) \times 10 + (500\,Hz) \times 9$$
$$= 44500\,Hz \Rightarrow 44.5\,KHz$$

(b)

DATA:

$r = 4$
$S = 3000$
$N = ?$

SOL:

As we know that,

$S = N \times 1/r$,

or by formula, we can say.

$N = S \times r$,

put values,

$N = 3000 \times 4$
$N = 12000$ bps.

(C)

→ DIFF B/W DATA ELEMENT & SIGNAL :

→ The main difference b/w data element and signal element is that data is reffered to as raw data, In order to Transfer data electronically It must first be converted into electronic signals.

→ Then the signals can be used to transfer data from one device to another. This signal can be either analog or digital.

OR

→ Data elements are what we need to send, signal elements are what we can send.

→ Data elements are being carried and signals are the carrier.

(d)

→ DIFF B/W LINK & CHANNEL IN MULTIPLEXING :

→ In multiplexing, A link reffers to a physical path and channel reffers to a small portion of the link or the physical path that carries the transmittion b/w a given pair of line.

→ Only a single link can have (n) numbers of channels, i.e many channels.

(e)

→ SERIAL TRANSMISSION :

→ In serial transmission data bit flows from one computer to another in bi direction, so we need only one communication channel instead of many as it transfers data bit by bit.

→ The 3 different techniques in serial transmittion are

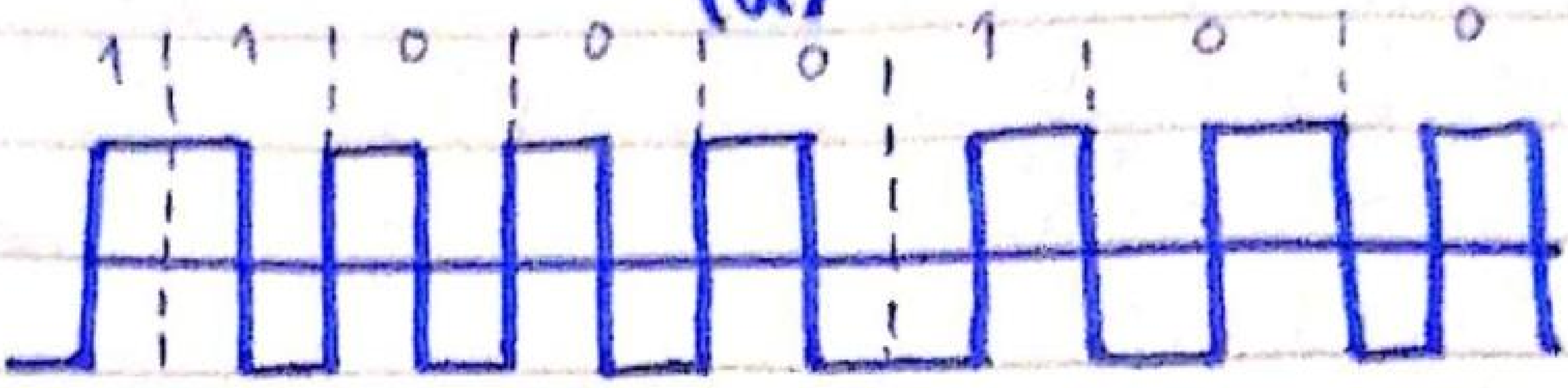
1. Synchronous :- In a synchronous serial transmittion, we send bits in a serial order without any gaps, i.e in regular intervals.

2. Asynchronous :- In this, we send 1 start bit at the beginning and 1 or more stop bits at the end of each byte. i.e. in irregular intervals.

3. Isynchronous :- here we send data in the form of blocks asynchronously.

· Q NO 2 ·

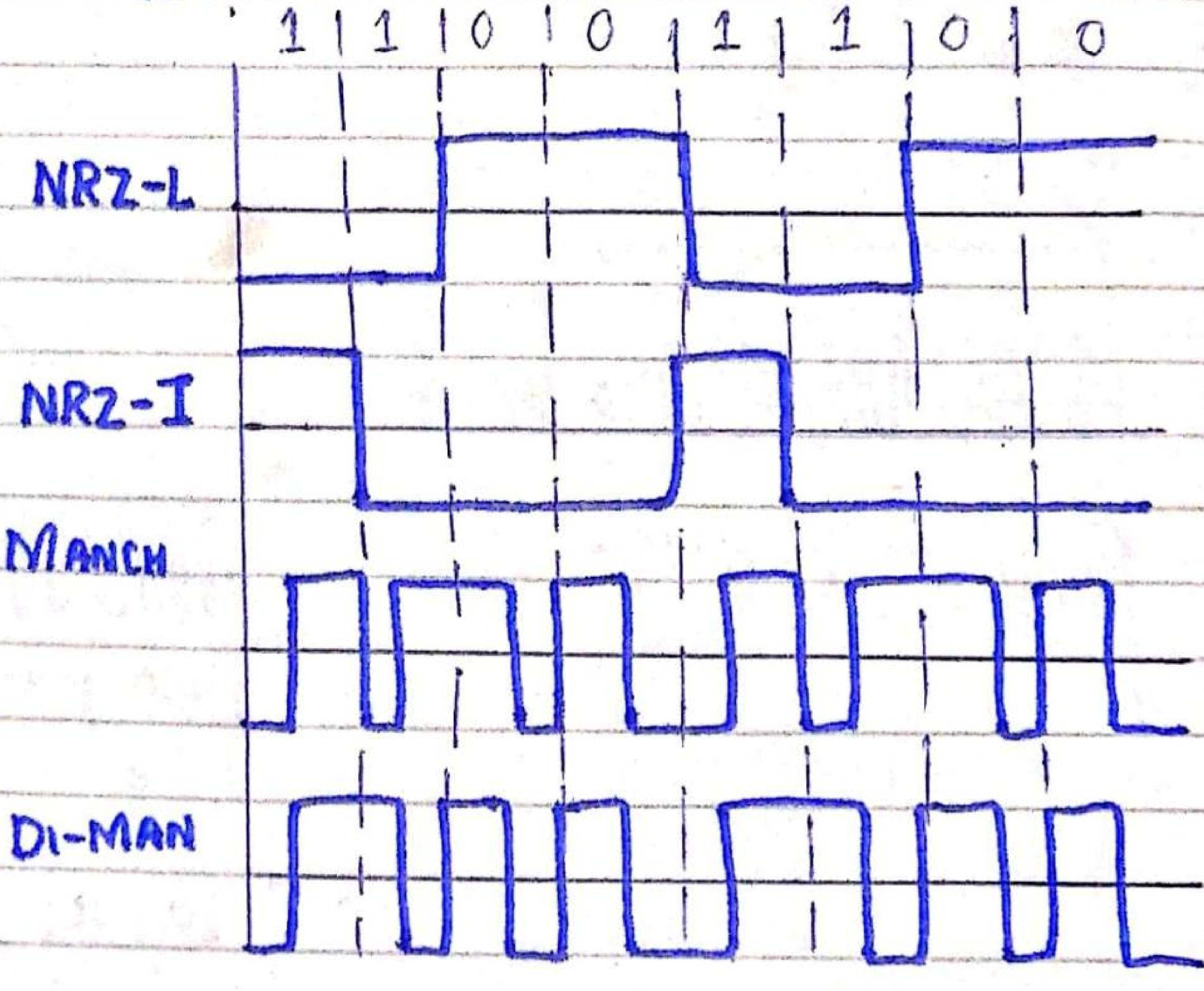
(a)



DIFF MANCHESTER : 11000100

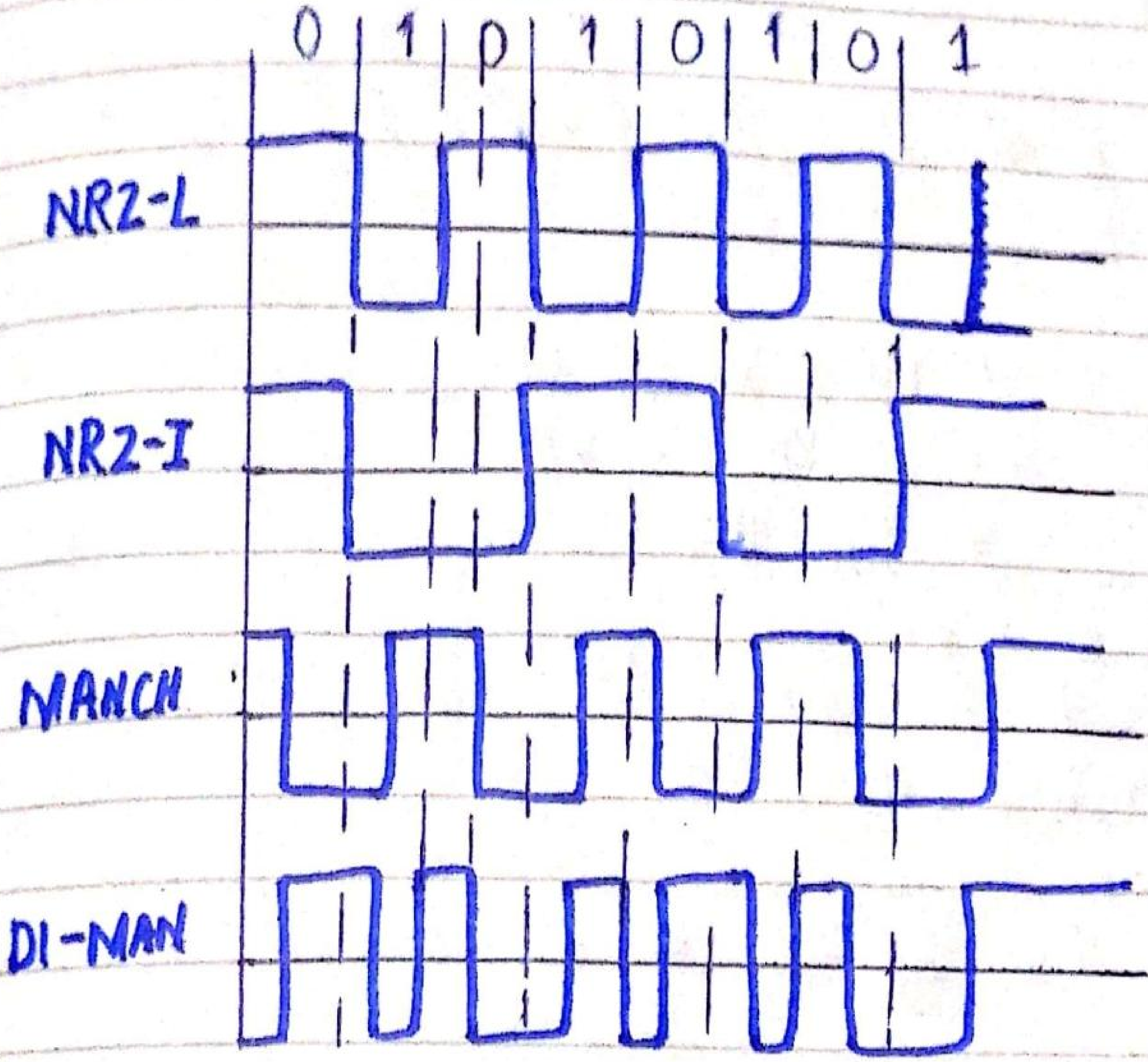
(b)

DRAW : (11001100) :



(b.2)

→ 01010101



(C)

Sol:

Bandwidth = High f − lowest f

So, here,

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

$$x = 950\,KHz + 450\,KHz$$

$$= 1400\,KHz.$$

As we know,

the Nyquist sampling rate should be twice the max f,

So,

$$C = 2 \times 1400 \Rightarrow 2800\,KHz.$$

Q NO 3.

(a)

→ The middle of the bandwidth is located at 650 KHz.

Thus the carrier frequency will be, $f_c = 250$ KHz.

By formula of bandwidth, we can get the bit rate,

$$B = (1+d) \times S = 2 \times N \times 1/r = 2 \times N = 300 \text{ KHz}.$$

So,

$N = 150$ kbps.

(b)

→ BINARY AMPLITUDE SHIFT KEYING:

→ Although, we can have several levels of signal elements, each with a different amplitude. Ask is normally independant using only two levels.

→ This is reffered to as binary amplitude shift keying or on-off keying (OOK).

→ The peak amplitude of one signal level is 0; and the other is same as that of the carrier frequency (fc).

Q No 4.

(a)

→ FDM MULTIPLEXING & DEMULTIPLEXING:

→ FDM is an analouge technique that can be applied with the bandwidth of a link (Hz) is greater than the applied bandwidths of the signals to be transmitted.

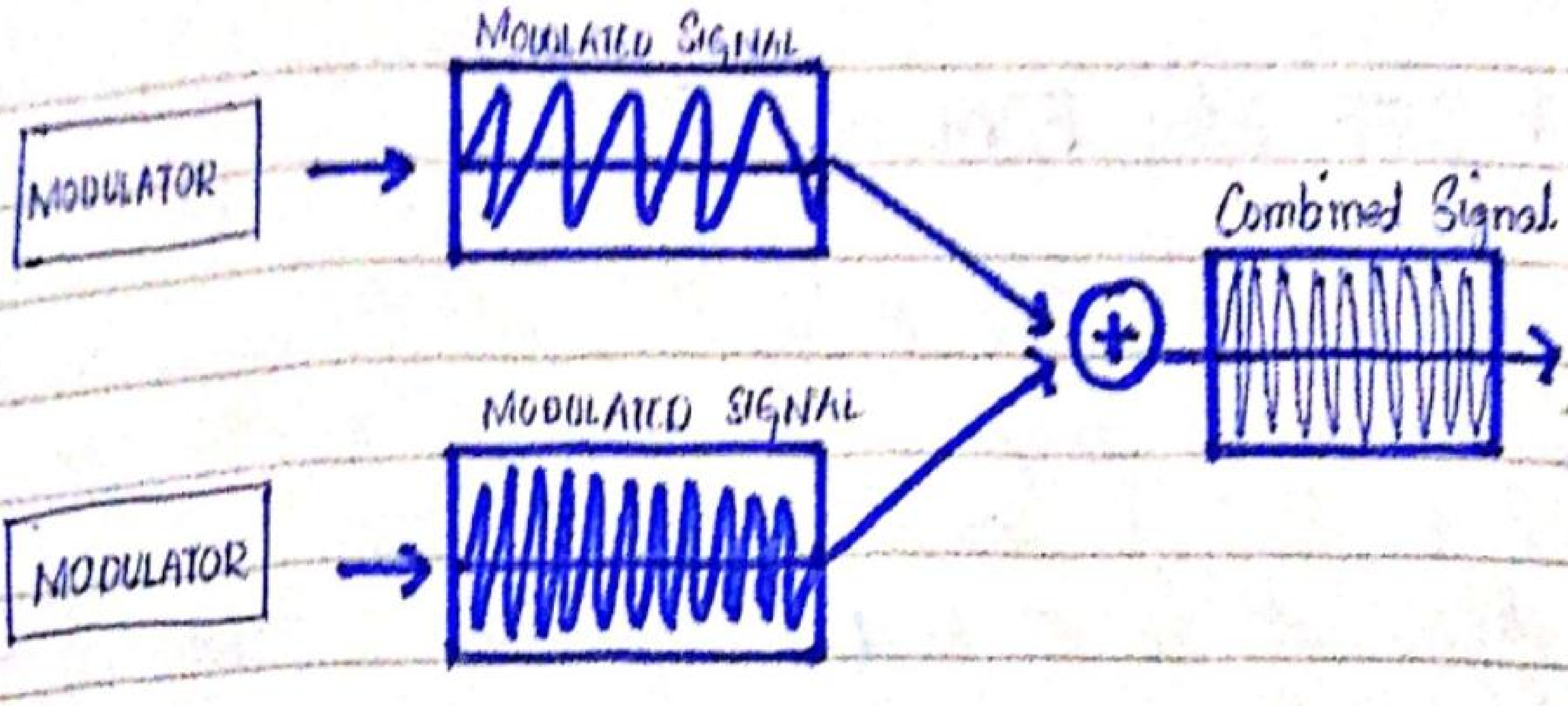
→ In FDM, signals generated by each sending device modulates different carrier frequencies.

→ These modulating signals are then combined into a single composite signal that can be transported by the link.

→ In FDM each signal is assigned a different frequency.

→ The carrier frequencies have to be different enough to be different to accomodate the modulation and demodulation signals

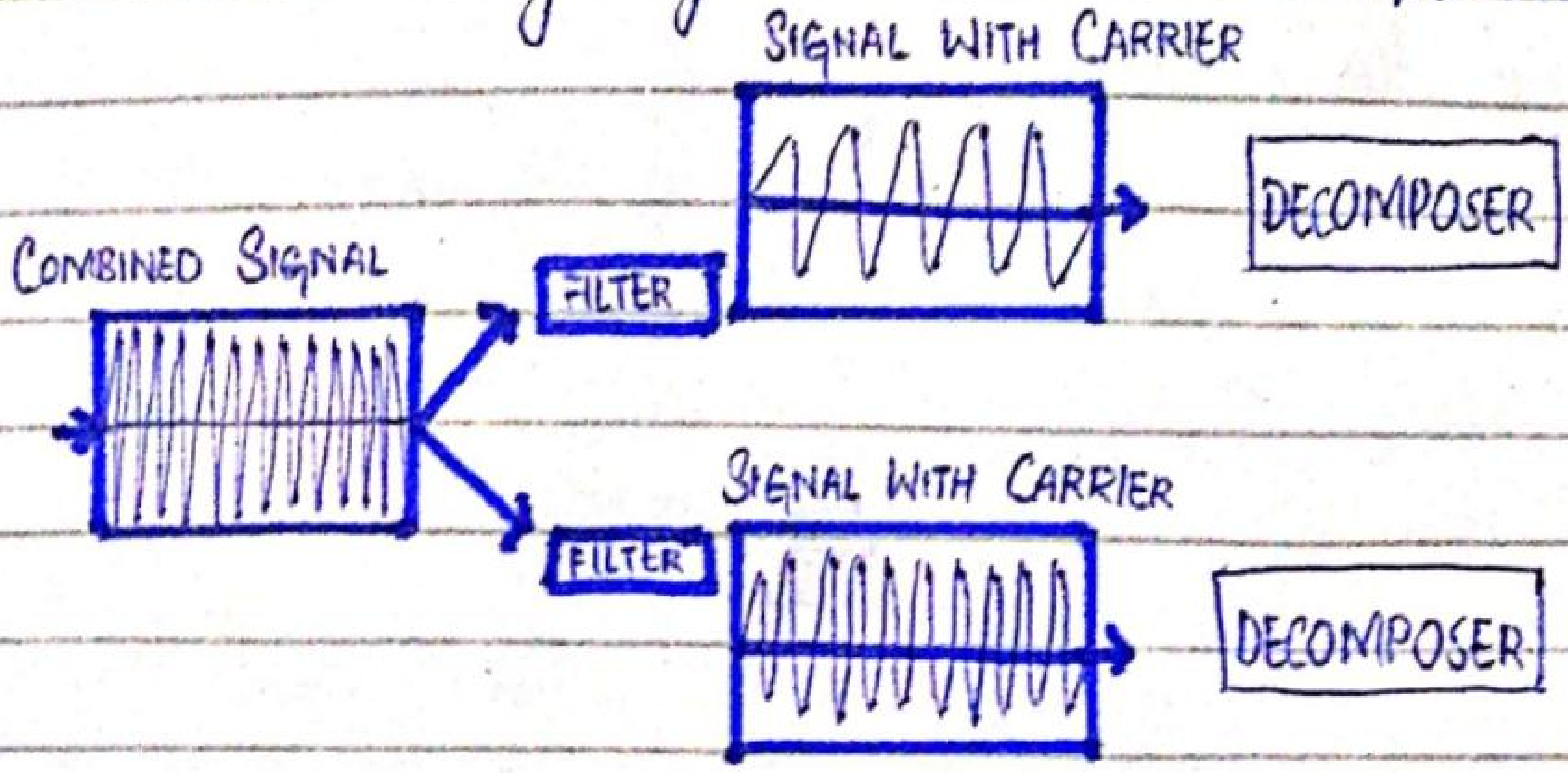
→ The FDM multiplexing process starts by applying amplitude modulation into each signal by using different carrier frequencies as f_i and f_j then both signals are combined



→ In the demultiplexing process, we use filters of different kinds to decompose the multiplexed signals into its constituent component signals.

→ Then each signal is passed to an amplitude demodulation process to seperate the carrier signals from the message signals.

→ The message signal is then sent to the reciever.



→ DIFF B/W FDM AND TDM :

→ Both FDM and TDM are multiplexing techniques.

→ The main difference b/w FDM and TDM is that in FDM, indivisul signals are given different frequency within a common bandwidth for transmission.

→ Where as in TDM, the multiple signals are transmitted in different time slots on a single channel.

→ And FDM is used for analoug transmittion of signals eg:- Audio signals at radio is achieved by FDM.

→ Whereas TDM can be used for both analoug and digital signals.

Q NO 4.

(b)

→ ANALOG TO ANALOG CONVERSION :

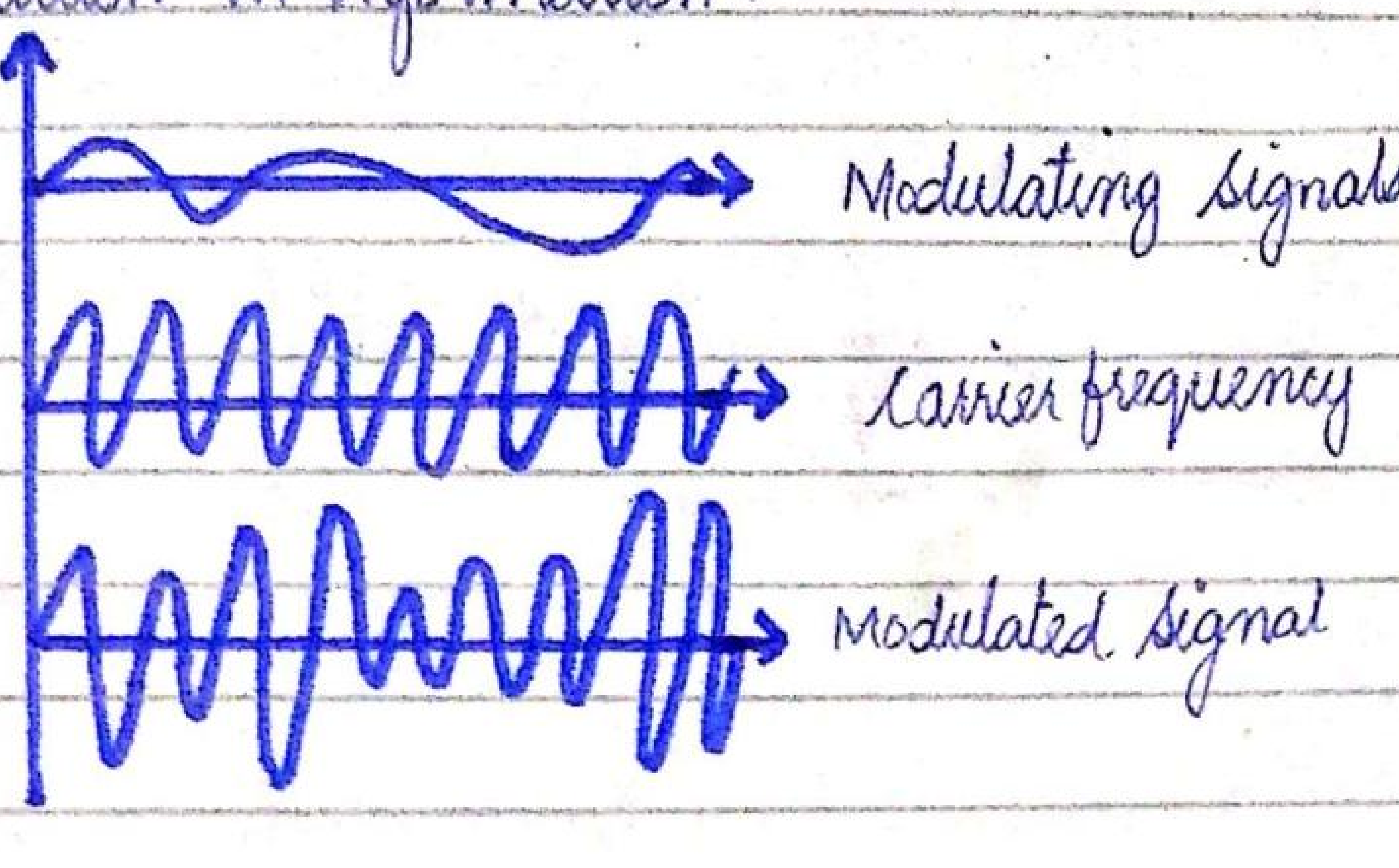
→ Analog to Analog conversion, is the representation of analog information by analog signals.
eg :- Radio.

→ There are three ways to accomplish analog to analog conversion:

1. AMPLITUDE MODULATION : (AM)

→ In AM transmission the carrier signal is modulated so its amplitude varies with the changing amps of the modulating signals.

→ The frequency and phase of the carrier remain the same. Only amplitude changes to follow variation in information.

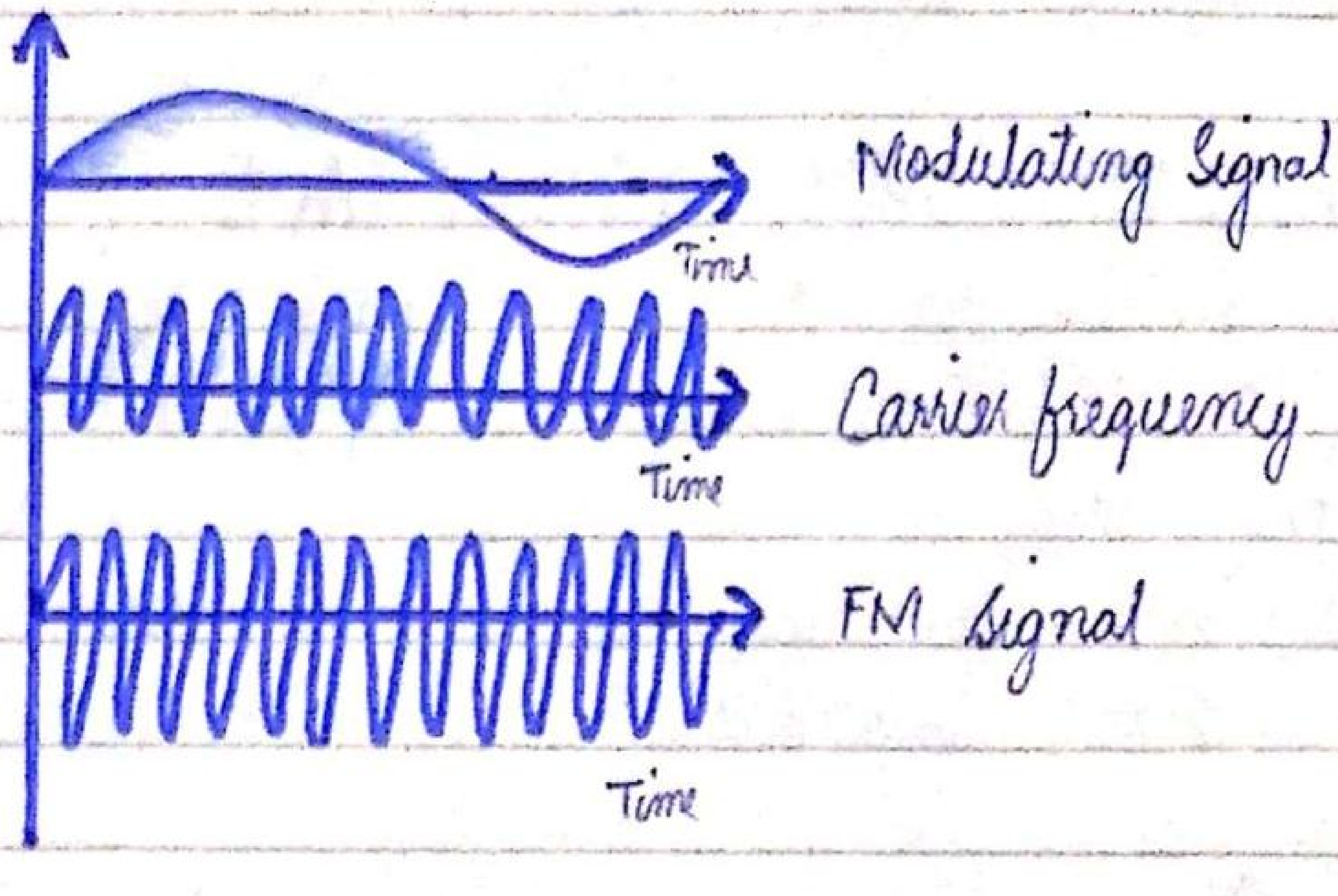


2. FREQUENCY MODULATION (FM) :

→ In FM transmission, the frequency of the carrier signal is modulated to follow the changing voltage level (amplitude) of the modulating signal.

→ The peak amplitude and phase of the carrier signal remain constant.

→ But, as the amplitude of the information signal changes, the frequency of the carrier changes correspondingly.



3. PHASE MODULATION (PM):

- In PM Transmittion the phase of the carrier signal is modulated to follow the changing voltage level of the modulating signal.
- The peak amplitude and frequency of carrier signal remain constant.
- The PM is the same as FM with one difference.
- In FM the instantaneous changes in the carrier frequency is proportional to the amplitude of the modulating signal where as PM the instantaneous changes in the carrier frequency is proportional to the derivative of the amplitude of the modulating signal.