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Assign Communication & Networ

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(1)

(A) Assume that a voice channel occupies a bandwidth of 4 KHz We need to multiple 10 voice channel with guard bands of 500 Hz using FDM, calculate the required bandwidth?

Solution:-

For multiplex 10 voice channels we need nine guard bands so to calculate the required bandwidth then $B = (4KHz) \times 10 + (500Hz) \times 9$

We convert 500Hz to KHz = 500Hz = 0.5 KHz

$(4KHz) \times 10 \quad (0.5KHz) \times 9$

$40 + 4.5$

$44.5 KHz$ Ans

(B)

Given data.

$r = 4$

$S = 3000$

$N = ?$

We know that

$S = n \times \frac{1}{r} \quad = \quad N = S \times r$

$= 3000 \times 4 = 12000 kbps$

Q1 Distinguish b/w a signal element and a data element?

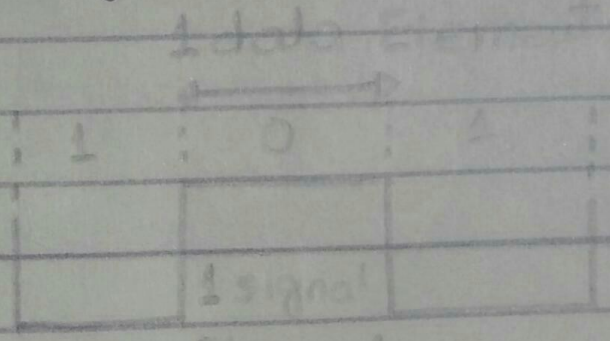
Signal Element:

A signal element is the shortest unit of a digital signal, Signal elements are what we can send, Signal elements are the carries.

Data Element:

A data element is the smallest entity that can represt a piece of information, Data elements are what we need to send, Data elements are being carried.

Diagrams:-



one data element per one signal element r=1

(3)

(d) Distinguish between a link and a channel in multiplexing?

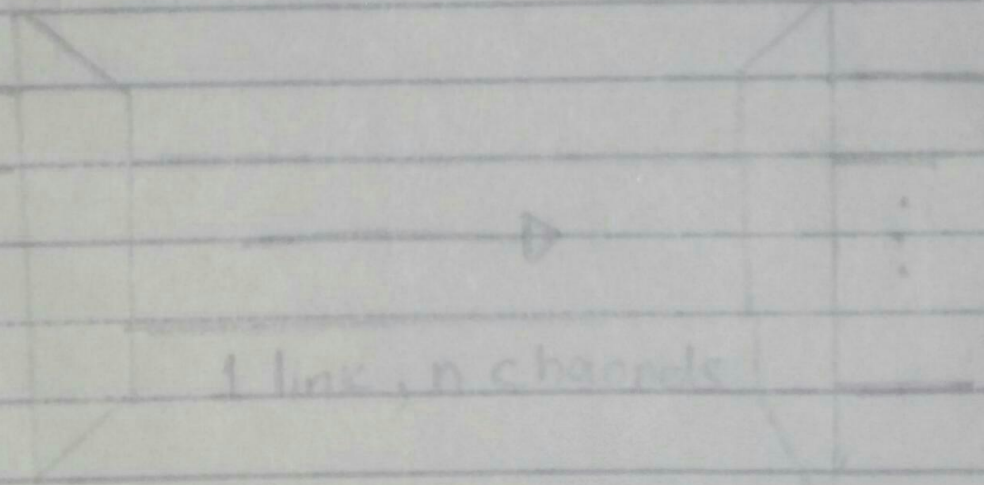
Link:-

In multiplexing the word link refers to the physical path.

Channel:-

The word channel refers to the portion of a link that carries a transmission between a given pair of lines, one link can have many channels.

Diagram:



(4)

Q1. List three diff techniques?

Ans The three different techniques in Serial transmission are following:

Serial transmission plays a vital role in data transmission, it transfer bit by bit.

i) Asynchronous:

In this we send 1 start bit at the beginning and 1 or stop bits at the end of each byte.

Example:-

irregular intervals

ii) Synchronous:-

In this, we send bits, in a serial order without any gaps

Example::

Regular intervals

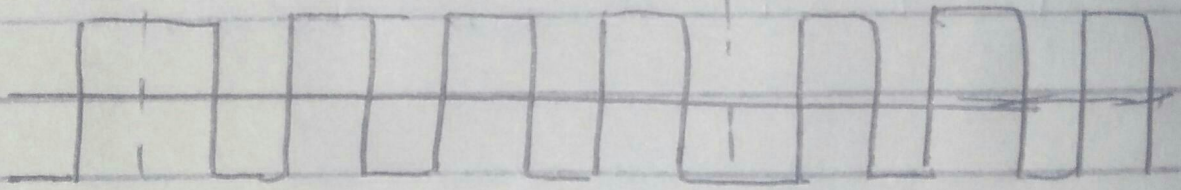
iii) Asynchronous:-

It sends a block of data asynchronously

(5)

Q 2 Sec A

1 1 0 1 0 0 1 0 0

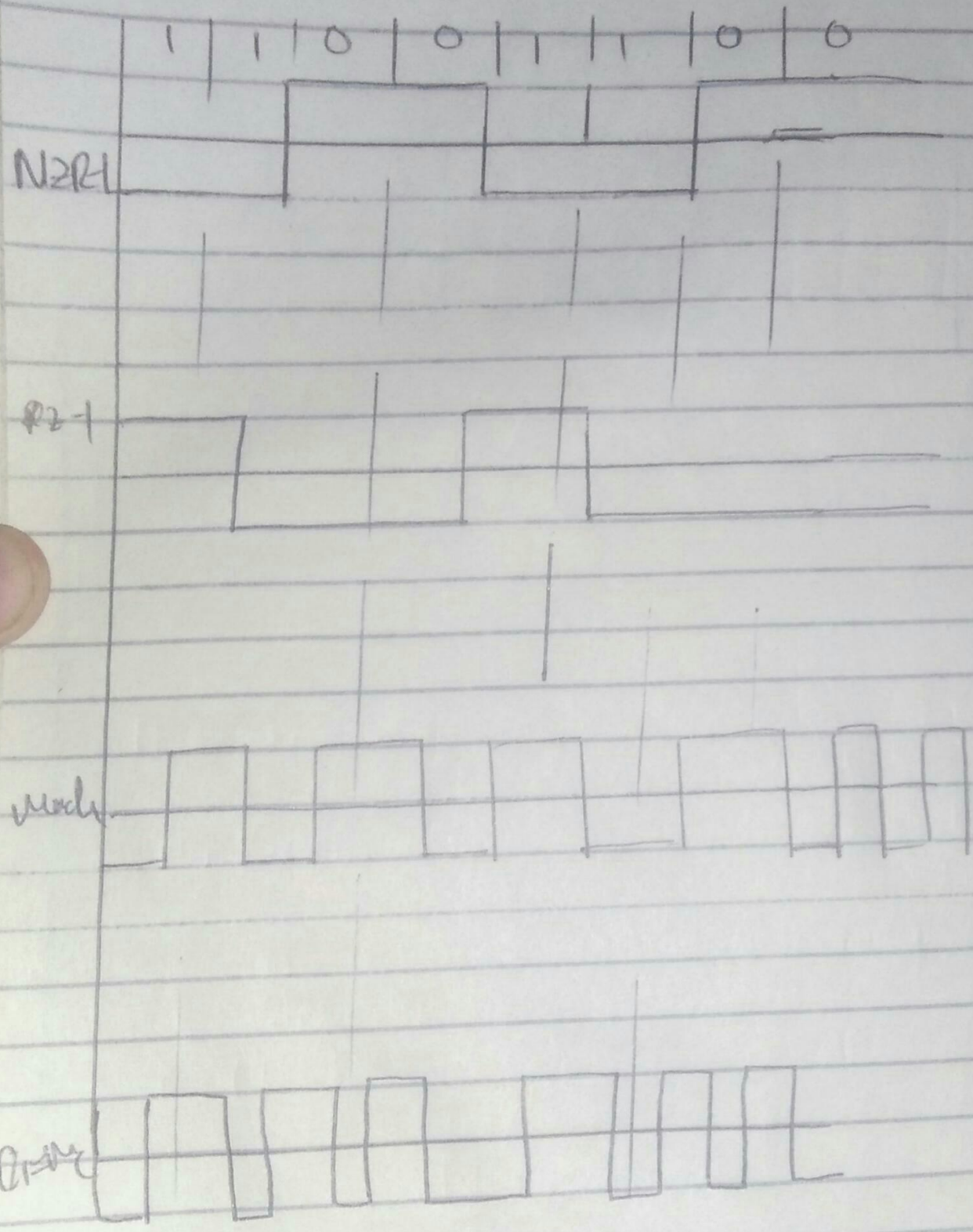


Manchester:-

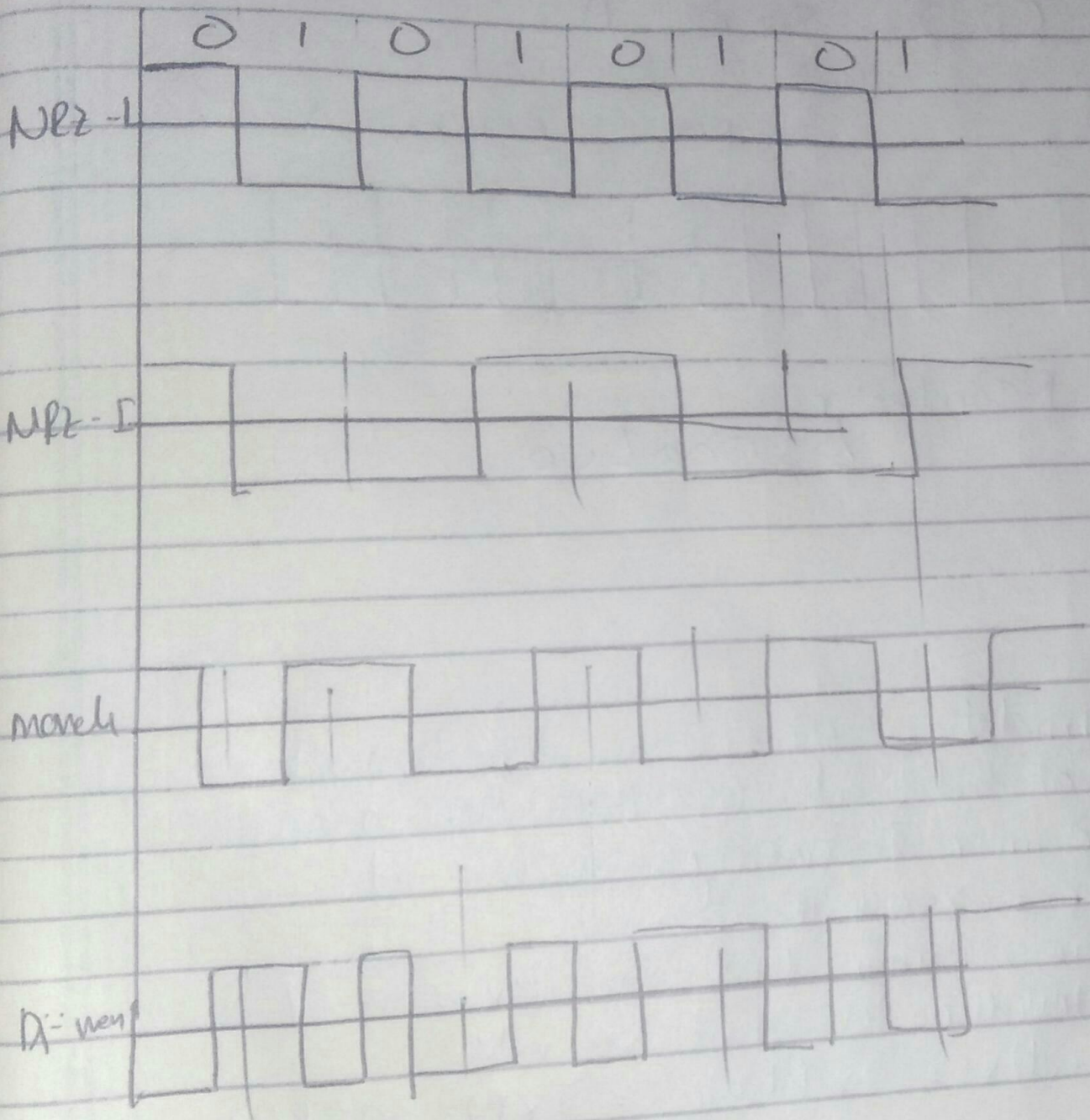
1 1 0 0 0 1 0 0

(b)

Q 2 Sec b (a)



Q2 sec b (b)



q2c

The nyquist sampling rate is two times the highest frequency of the input signal, If the input signal has a high frequency component of 1 kHz then the Sampler must sample at least 2 kHz.

~~fmax = 2B log2~~

Bandwidth = highest frequency − Lowe fre

950KHz = x − 450kHz

x = 950 + 450 = 1400 kHz

Nyquist sampling rate = should be at least twice the maximum freq Hence nyquist Sampling rate = 2 x 1400 kHz

= 2800 kHz Ans

Q2 c:- Or by second method

Sol:-

a. Bandwidth = f_{max} = 950 KHz

Nyquist sampling rate = 2 x 950 KHz

= 1900 KHz

= 1900000 per second

b. f_{max} = 450 + 950 KHz = 1400 KHz

Nyquist Sampling rate = 2 x 1400 KHz

= 2800000 per sec

Q3 a:-

The middle of the bandwidth is located at 650 KHz. thus means our carrier frequency can be at

$f_c = 250$ KHz

we know that the formula of bandwidth to find bit rate

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

$N = 150$ Kbps.

Q3 b:-

~~Binary amplitude shift keying.~~

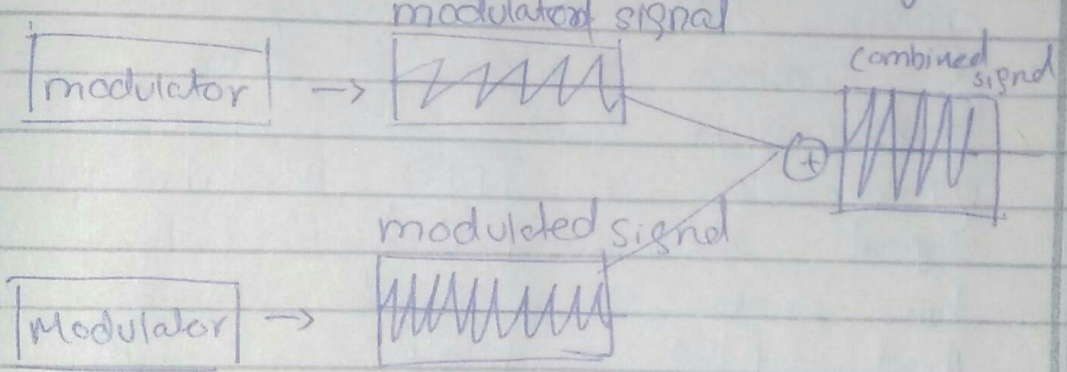
Binary amplitude Shift keying is ~~Used~~ technique is Used in the given diagram.

- 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 carrier frequency.

Q4 A:-

FDM multiplexing & demultiplexing:
FDM is analogue technique that can be apply with the bandwidth of a link is greater than the applied bandwidth of the signals to be transmitted.

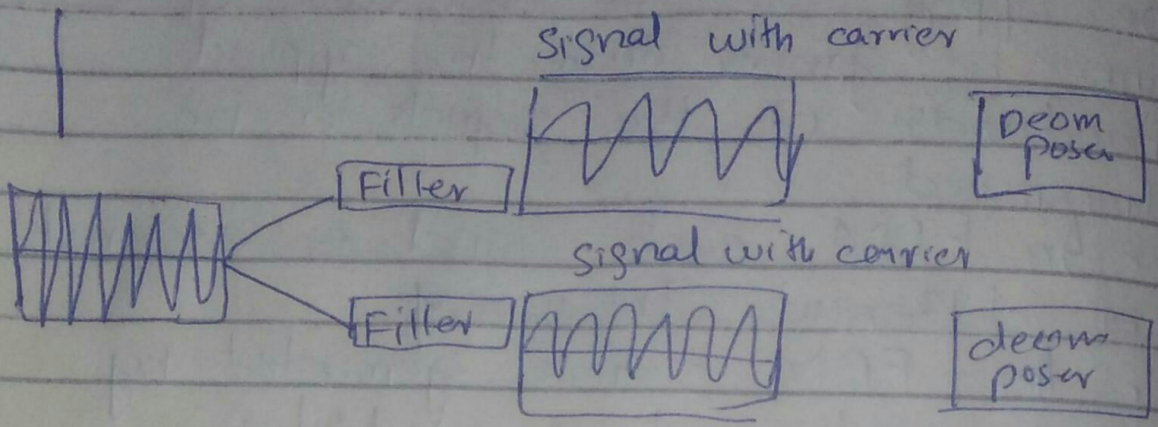
- In FDM each signal is assigned a different frequency.
- In FDM signals generated by each modulating device modulates different carrier frequencies.
- These modulating signals are then combined into a single composite signal that can be transported by the link.



- 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 separate the carries.

Signals from the message signals.

* The message signal is then sent to the receiver.



Difference:

- Both are multiplexing techniques
- The main difference b/w them is that FDM, individual signals are given different frequency within a common bandwidth for transmission.

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

And FDM is used for analog transmission of signals

Where TDM can be used for both analogue and digital signals.

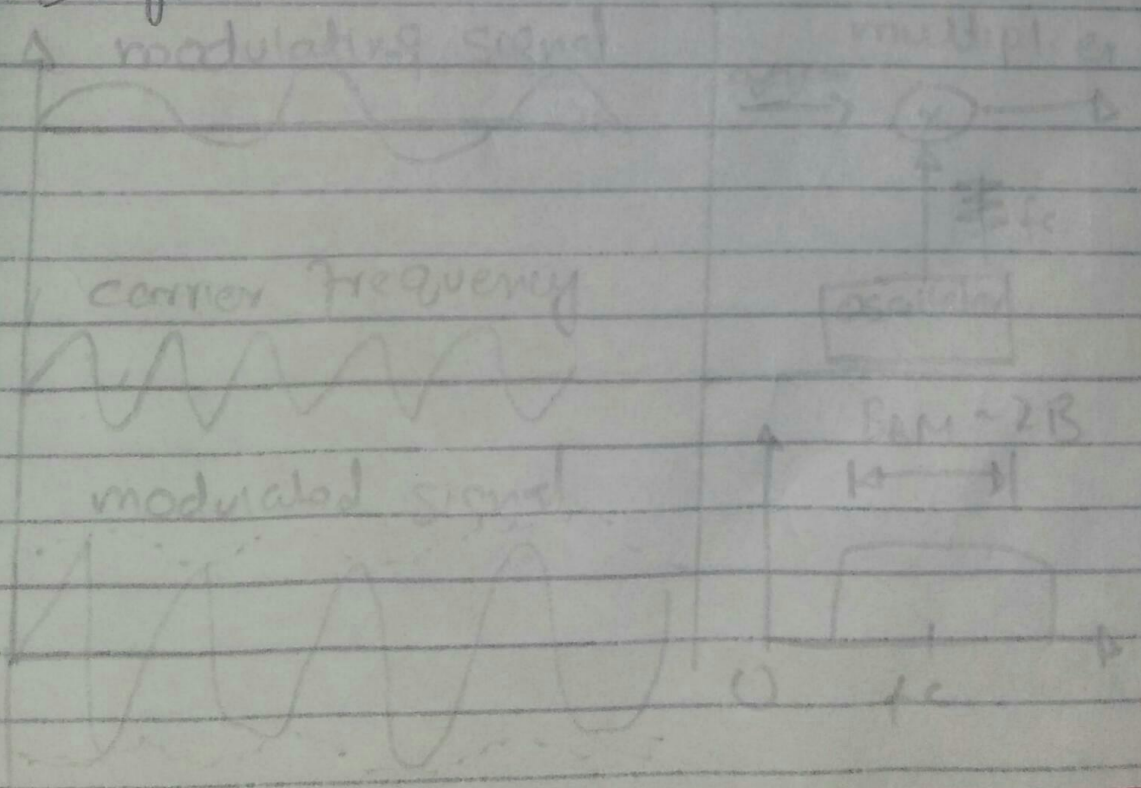
Q4 b:-

Analog to analog conversion can be accomplished in three ways.

Amplitude modulation (AM):

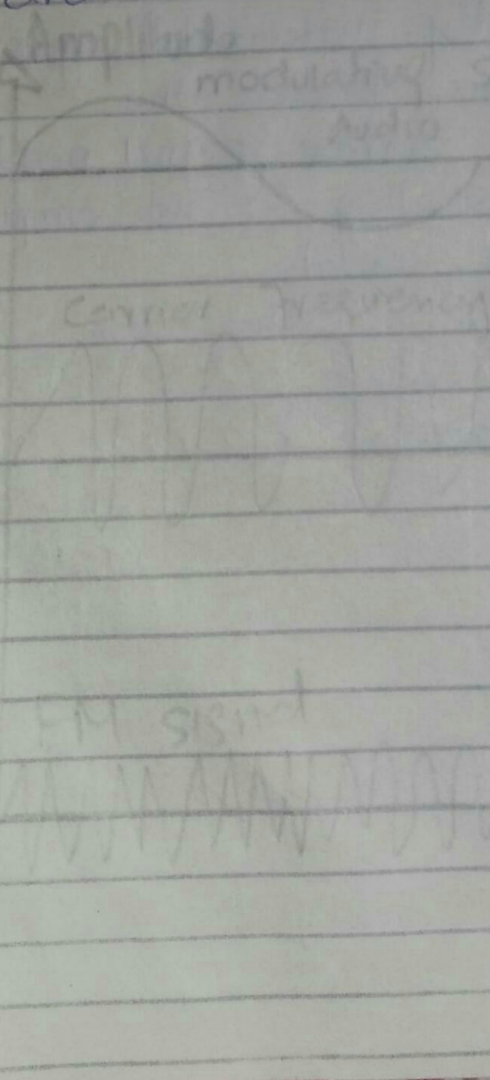
- In AM transmission, the carrier signal is modulated so that its amplitude varies with the changing amplitudes of the modulating signal.
- The frequency and phase of the carrier remain the same; only the amplitude changes to follow variations in the information.
- The modulating signal is the envelope of the carrier.
- AM is normally implemented by using a simple multiplyer because the amplitude of the carrier signal needs to be changed according to the amplitude of the modulating signal.

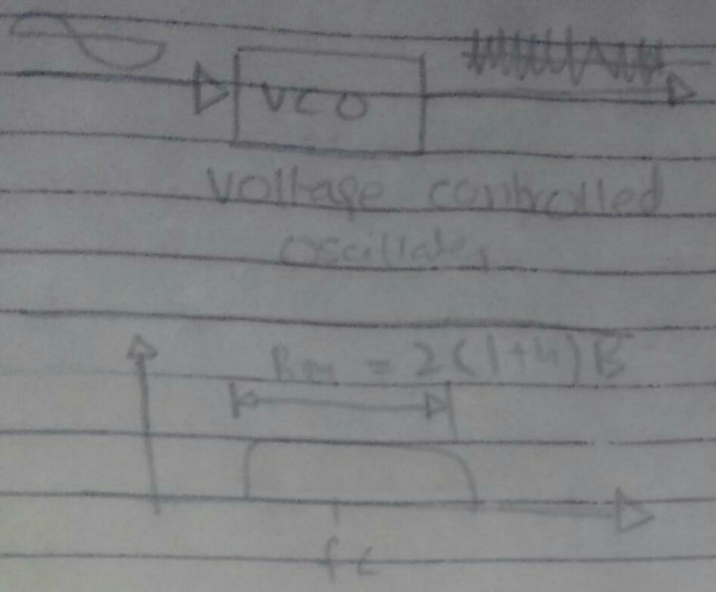
Diagram:-



2 Frequency modulation FM

- In FM transmission, the frequency of the carrier signal is modulated to follow the changing voltage level of the modulated signal.
- 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.
- Figure shows the relationships of the modulating signal, the carrier signal and the resultant FM signal.





phase modulation PM:-

- In PM transmission, the phase of the carrier signal is modulated to follow the changing voltage level (amplitude) of the modulating signal.
- The peak amplitude and frequency of the carrier signal remain constant, but as the amplitude of the information signal changes, the phase of the carrier changes correspondingly.

Figure shows the relationship of the modulating signal, the carrier signal, and the resulting PM signal.