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Department Bs(cs)

Semester 4th

Paper Data communication & Networks

Date 27/june/30

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Answer all the Questions.

Q No (a)

Assume that a voice chanel occupies a bandwidth of 4KHz. We need to multiplex 10 voice channels with guard bands of 500Hz using FDM. Calculate the required bandwith.

Sol:-

To multiplex 10 voice channels, we need nine guard bands. The required bandwidth is then

$$B = (4\text{KHz}) \times 10 + (500\text{Hz}) \times 9$$

$$= 44.5\text{ kHz}.$$

Q No 1 (b)

An analog signal carries 4 bits per signal element. If 3000 signal elements are sent per second. Find the bit rate.

Solution:-

In this case $r = 4$, $S = 3000$ and N is unknown.

We can find the value of N from.

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

$$N = S \times r$$

$$N = 3000 \times 4$$

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

Or

$$N = 12 \text{ kbps}.$$ Ans

Q No Sec (c)

- Distinguish between a signal element and a data element.

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

Q No 1 (D)

- Distinguish between a link and a channel in multiplexing.

Link	Channel
* Link refers to the physical path.	Channel refers to the portion of a link that carries a transmission b/w a given pair of lines.
* The permanent link includes only that portion of the cabling installation that is permanent	The channel includes two or more patch cables and may include multiple patch panels - possibly in multiple closets.

Q No 1 Sec (e)

- List three different techniques in Serial transmission and explain differences.

Ans) Following are the three different techniques in Serial transmission.

1) Asynchronous transmission
2) Synchronous transmission.
3) Isochronous transmission.

i) 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 irregular intervals.

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

iii) isynchronous:-
It sends a block of data asynchronously.

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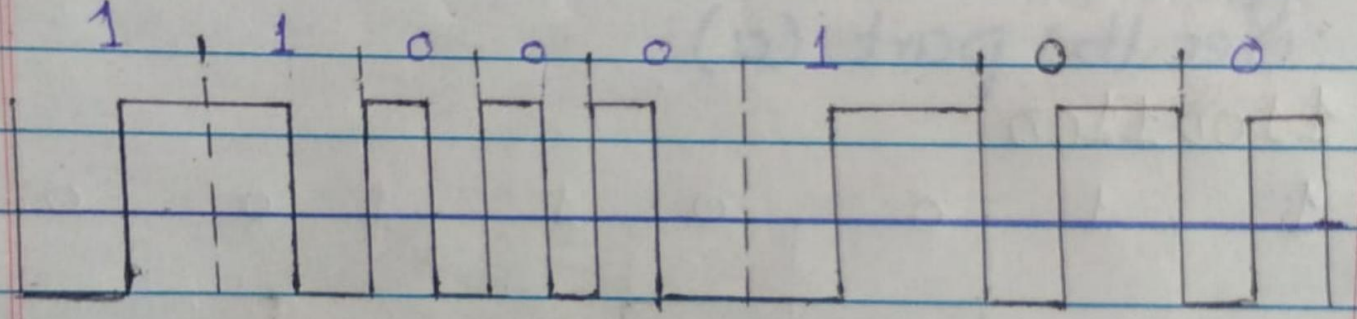
Q2 (a)

- Find the 8-bit data stream for the following

(Ans)



Diff Manchester

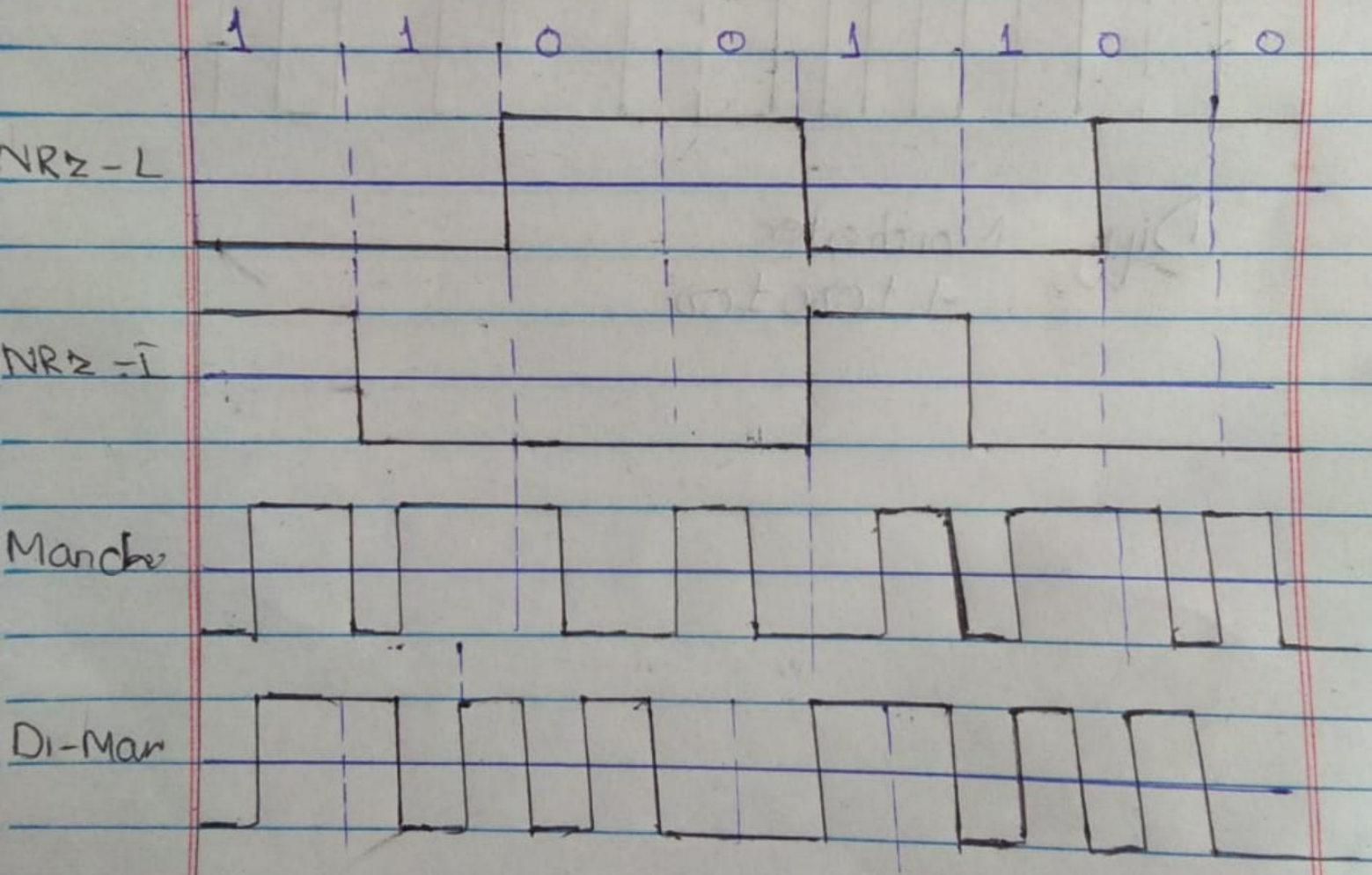
1 1 0 0 0 1 0 0

Q No (b)

- Draw the graph of Manchester, differential Manchester, NRZ-I & NRZ-L. Schemes for each of the following data stream.

Sec (b) part (a)

a. 11001100



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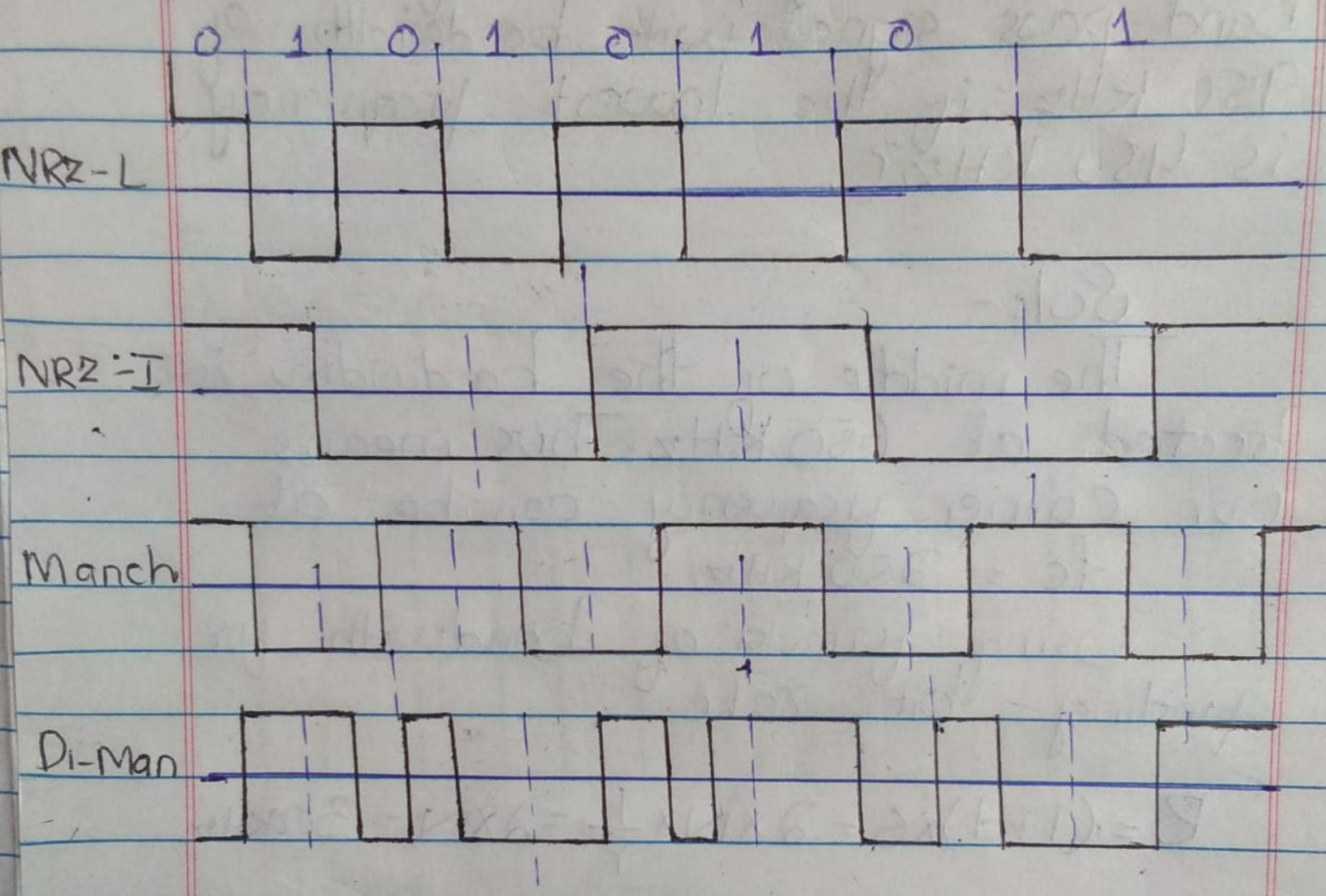
Sec-b (b)



Q NO 2 (c)

What is the Nyquist Sampling rate for the band-pass signal with bandwidth of 950 KHz if the lowest frequency is 450 KHz?

Sol

Bandwidth = high f − low f

$$900KHz = X - 450KHz$$

$$X = 950 + 450 = 1400KHz$$

Nyquist sampling rate => Should be at least twice the man frequency

Hence

Nyquist Sampling rate =

$$2 * 1400\ KHz$$

$$= 2800KHz \quad Ans$$

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Q No 3 (a)

- We have an available bandwidth of 300 KHz which spans from 500 to 800 KHz. What are the carrier frequency & the bit rate if we modulated our data by using ASK with d=1?

Sol

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

$f_c = 250$ KHz.

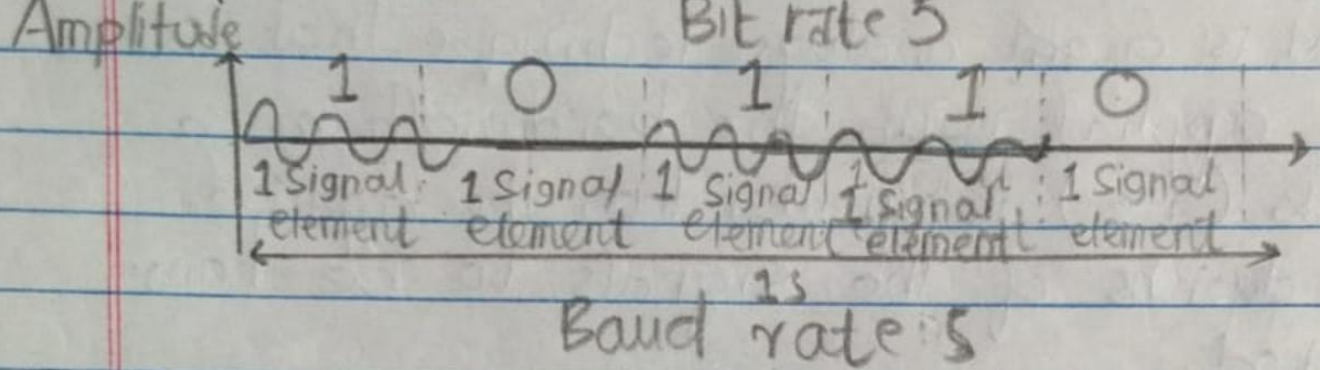
Using formula of bandwidth for finding bit rate.

$$B = (1+d) \times S = 2 \times N \times \frac{1}{\gamma} = 2 \times N = 300 \text{KHz}$$

$$N = 150 \text{Kbps}.$$

Q NO 3 (B)

- Which shift keying technique is used in the following diagram? Briefly explain.



Ans) "Binary Amplitude Shift Keying" technique is used in this diagram.

We have several kinds of signal elements, each with different amplitude, Ask is normally ~~use~~ implemented using only two levels.

* This is known as binary amplitude shift keying or on-off keying.
* The peak amplitude of one signal level is 0, the other is same as the amplitude of the carrier frequency.

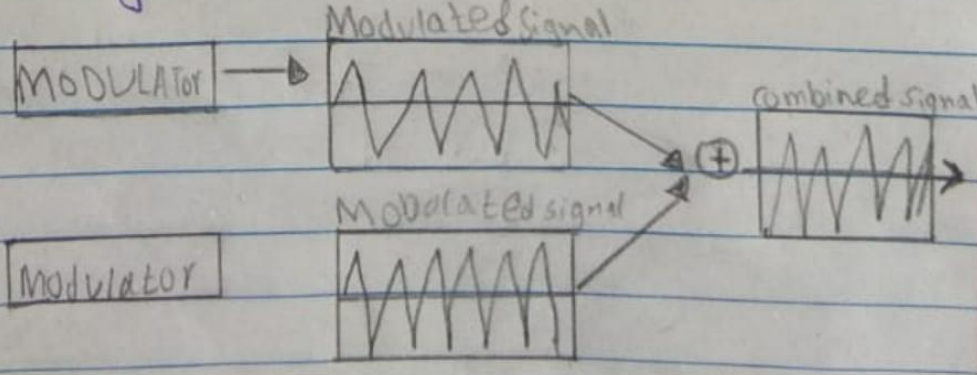
Qn# (a)

Ans. FDM Multiplexing & Demultiplexing:-

→ FDM is an ~~and~~ analogue technique that can be applied with the bandwidth of a link (Hz) is greater than the applied bandwiths 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 composit signal that can be tranported by link.
* In FDM each signal is assigned a different frequency.

→ The FDM multiplexing process starts by applying amplitude modulation into each signal by using different carrier frequencies as li & lj then both signals are combined



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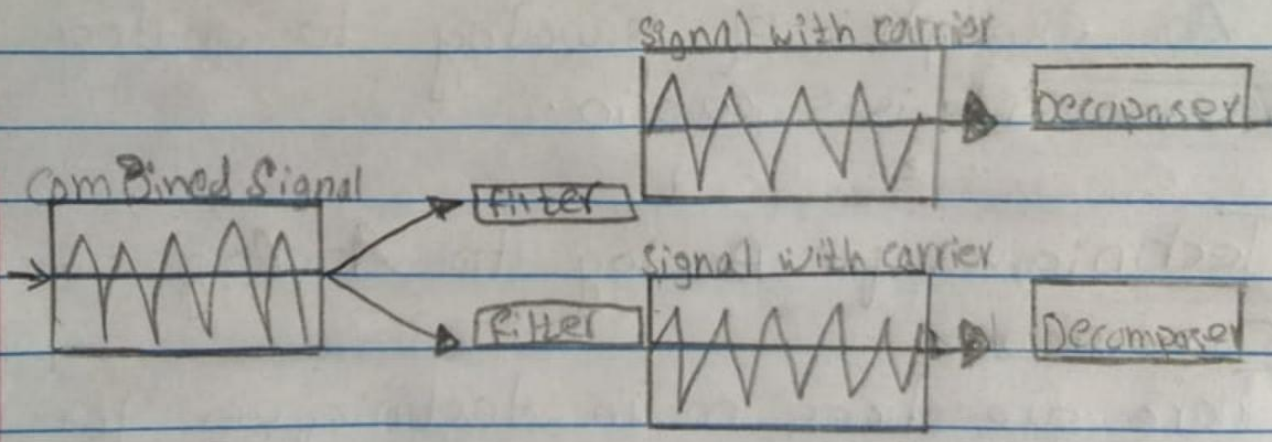
→ In the de multiplexing process, we use filters of different kinds to decompose the multiplexed signals into its constituent component signals.

* Then each signal is passed to an amplitude demodulation process to separate the carrier signals from the message signals.
* The message signal is then sent to the receiver.



Difference b/w FDM and TDM:

* The main difference b/w FDM and TDM is that in FDM, indivisual signals are given different frequency within a common bandwidth for transmission.
* Whereas in TDM, the multiple signals are transmitted in different time slots on a single channel.
* And FDM is used for analog transmission of signals eg:- Audio signals at Radio is achieved by FDM.
* Whereas TDM can be used for both analog & digital signals.

Q No 4 (B)

- Briefly explain Analog to Analog Conversion techniques with the help of diagrams?

Ans) Analog to analog Conversion:-

Analog-to-analog conversion is the representation of analog information by an analog signal.

Modulation is needed if only a band-pass channel is available to us.

An example of analog to analog conversion is radio.

Techniques for Analog to Analog Conversion.

There are three main techniques for Analog-to-Analog Conversion.

- Amplitude modulation (AM)
- Frequency modulation (FM)
- Phase modulation (PM)

* Amplitude modulation:-
* In AM transmission, the carrier signal is modulated so that its amplitude varies with changing amplitudes of the modulating signal.

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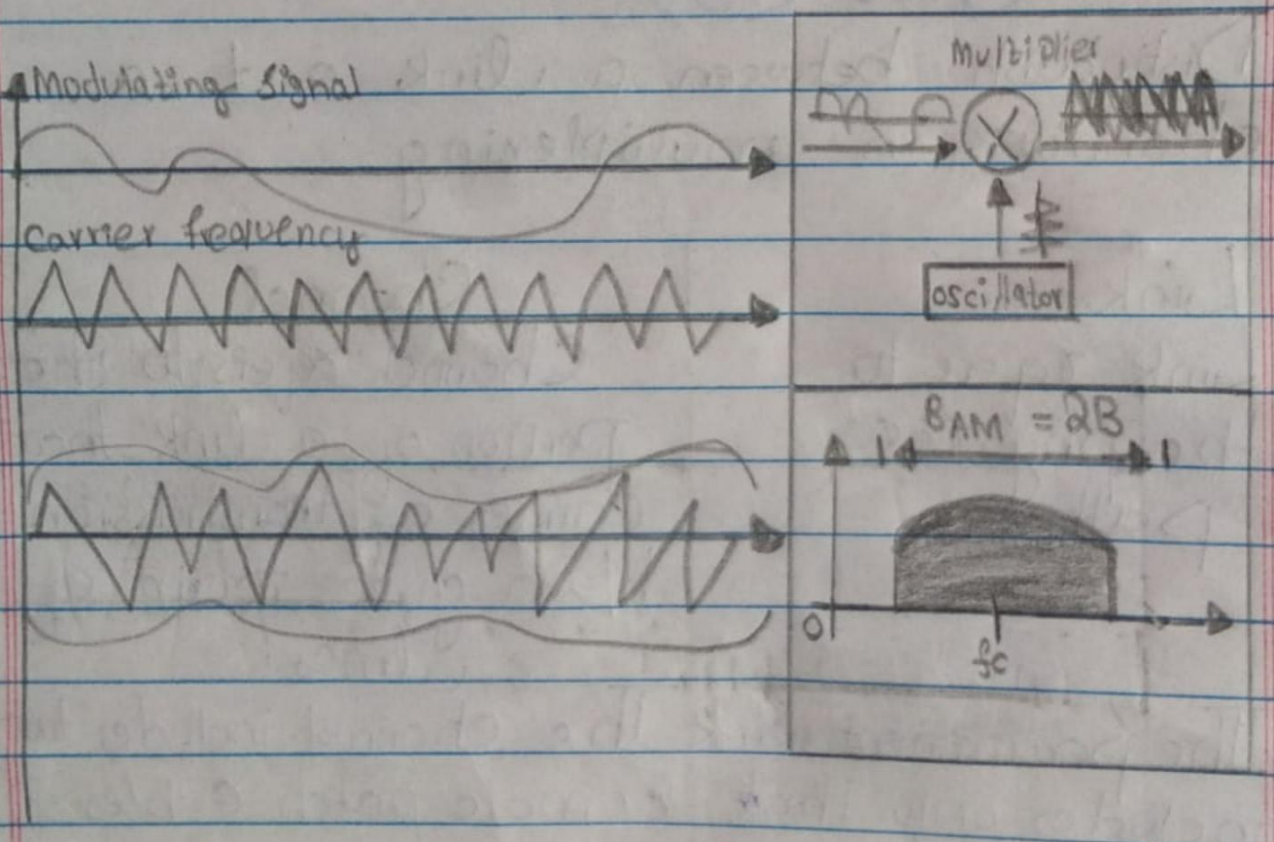
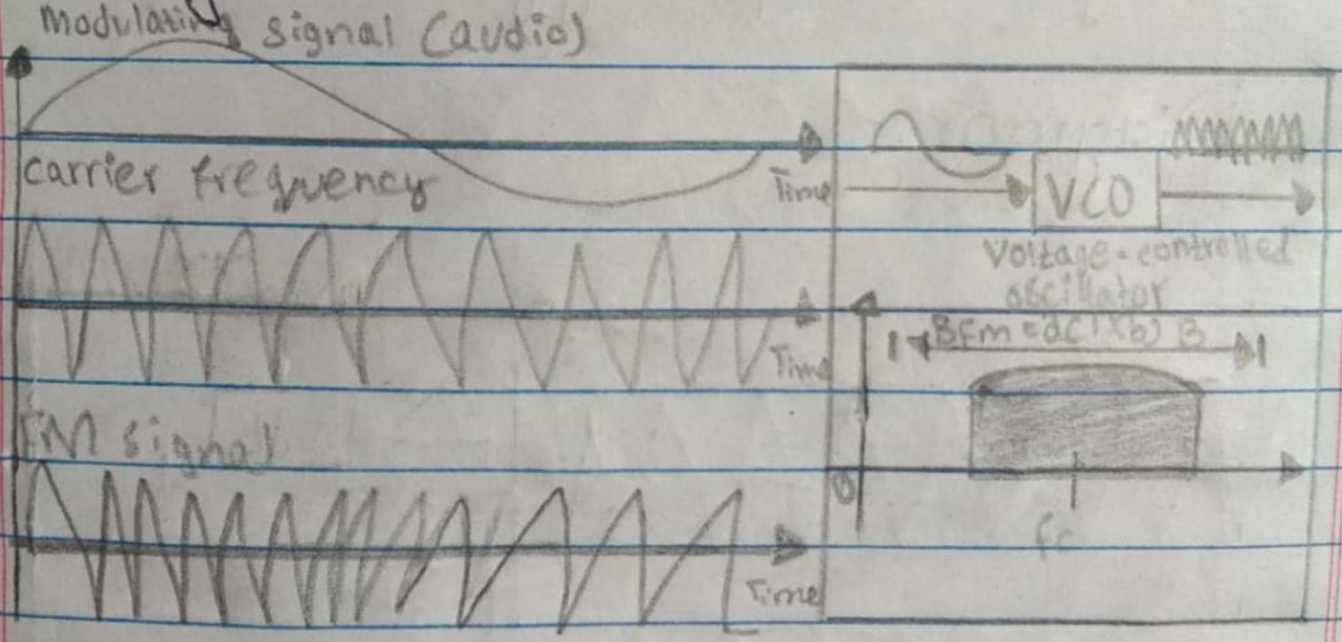
* The modulating signal is the envelope of the carrier.
* AM is implemented by using simple multiplier, because amplitude of the carrier signal change according to the amplitude of modulating signal.

Diagram:-



* Frequency modulation (FM)
* Freqvency of the carrier signal is modulated to follow the changing voltage level of modulating signal.
* FM is normally implemented by using a voltage-controlled oscillator as with FSK.

Diagram :-



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* Phase modulation (PM)

The Phase of the carrier Signal is modulated to follow the changing voltage level of modulating signal.

* The peak amplitude and frequency of the carrier signal remain constant, but when the amplitude of the information signal changes, the phase of the carrier changes correspondingly.

Diagram :-