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Subject D.C.N

Assignment Final - paper

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(1)

Q: No: 01:

Part (A):

To multiplex a  
10 voice channels,  
9 guard bands are  
needed.

So the required  
bandwidth would be

$$b = 4(\text{KHz}) \times 10 + (500\text{Hz}) \times 9$$
$$= 4 \times 10 + 0.5 \times 9$$

$$(b = 44.5 \text{ KHz})$$

Part (B):

In this case we  
have give the following  
data;

$$\delta = 4$$

$$S = 3000$$

(2)

$$N = ?$$

As we know,

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

or

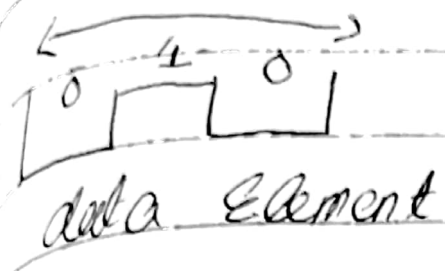
$$N = S \times \gamma = 3000 \times 4 = 12000$$

or  $\left( \begin{array}{l} N = 12000 \text{ bps} \\ N = 12 \text{ kbps} \end{array} \right)$

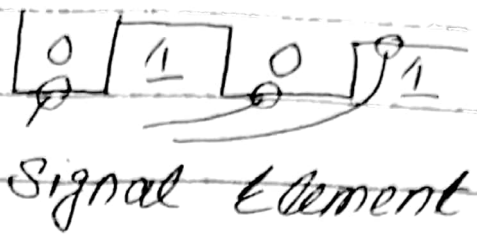
Part (c):

Data Element	Signal Element
The smallest entity that can represent a piece of information	Shortest unit of a digital signal. 1 (Time wise)
Data Element are being carried	Signal Elements are the carriers

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data Element



Signal Element

Part (D):

LINK

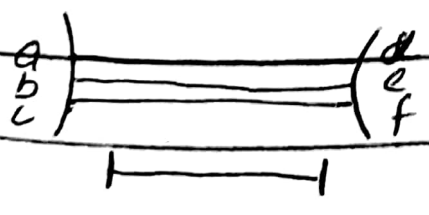
CHANNEL

LINK refer to the physical path.

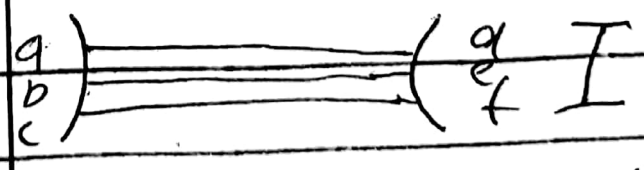
A portion of link that carries transmission between

one link can have many channels.

a give pair of lines.



one Link



N number of channels.

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Part (E):

Signal transmission

(1) Asynchronous:

In this type of serial transmission the timing of signal is unimportant.

(2) Synchronous:

In this type we send bits one after another without start / stop bit or any gaps.

(3) Isochronous:

In this the source and the target are each synchronized but each transmission contain start and stop bit.

(b)

More differences:

⇒ In Synchronous flow of data depend on external signal.

⇒ In Asynchronous data transfer does not depend on external quantity.

⇒ In Synchronous signal may be clock pulse or triggered.

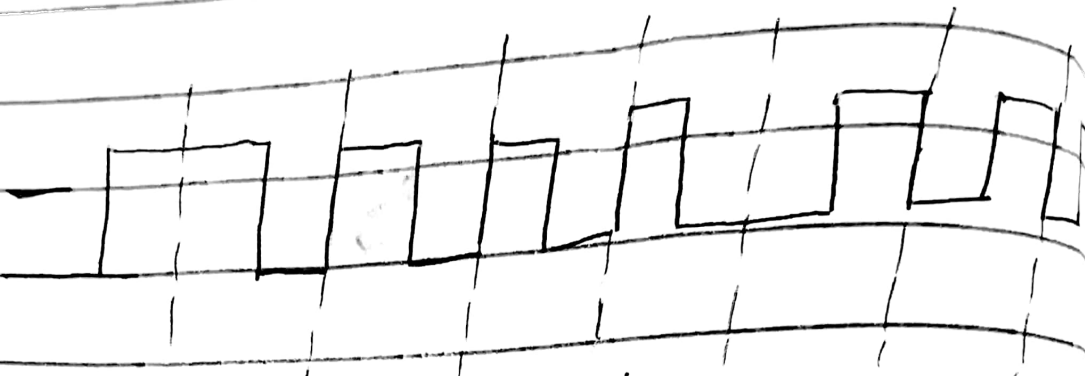
⇒ In Asynchronous signal is independent.

"Iso synchronous is the combination of these both."

⑥

Q: NO: 02:

Part A:



8 bit stream is

as we know  $\int = 1$   $\lceil = 0$

So 1, 1, 0, 0, 0, 1, 0, 0

Part B:

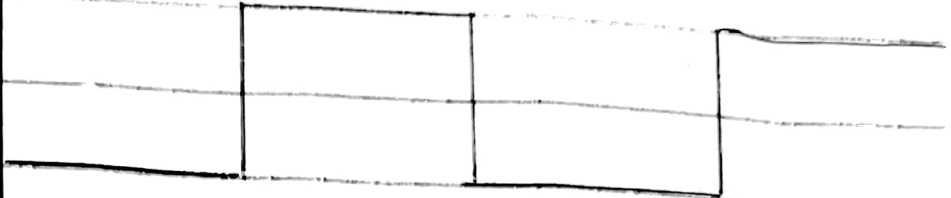
A = 11001100

The Required graphs are

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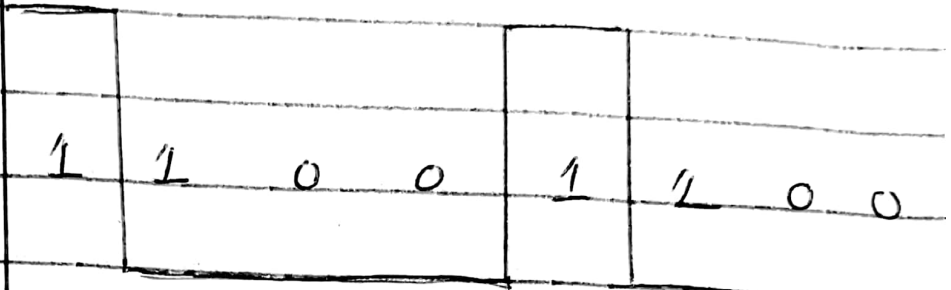
NRZ L

1 1 0 0 1 1 0 0



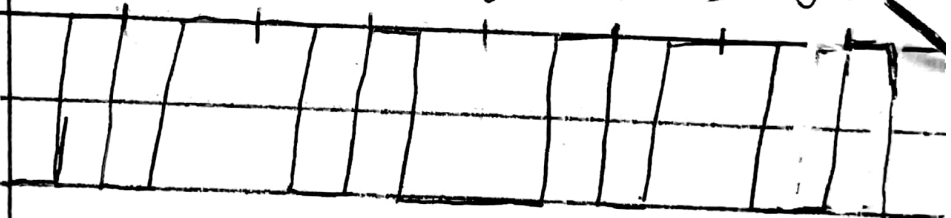
NRZ I

1 1 0 0 1 1 0 0



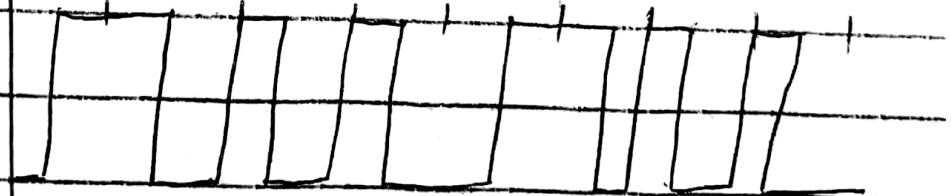
Manchester

1 1 0 0 1 1 0 0



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1 1 0 0 0 1 1 0 0





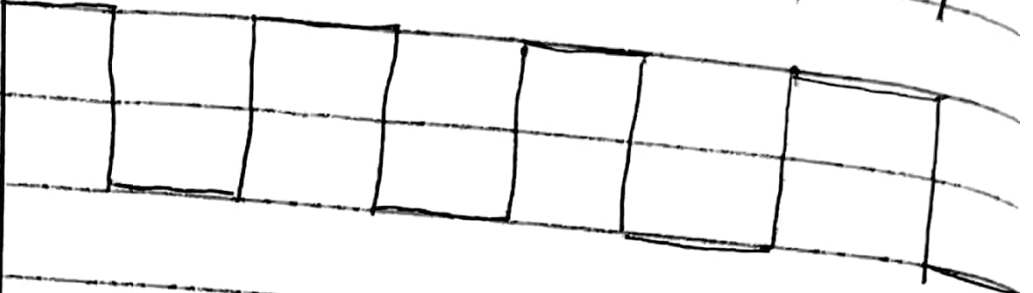
②

(b)

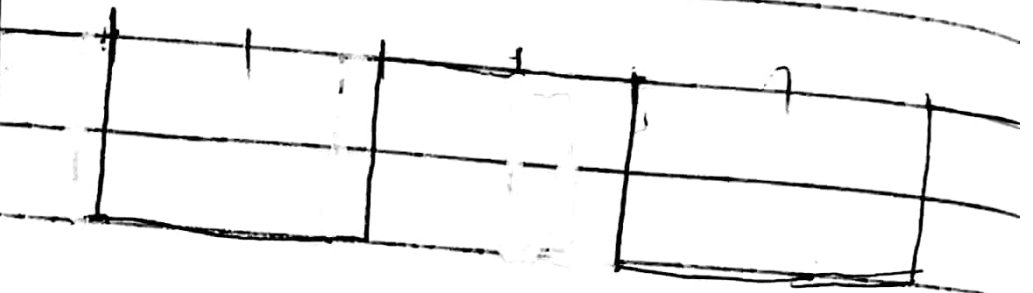
0 1, 0 1 0 1 0 1

0 1, 0 1, 0 1, 0 1

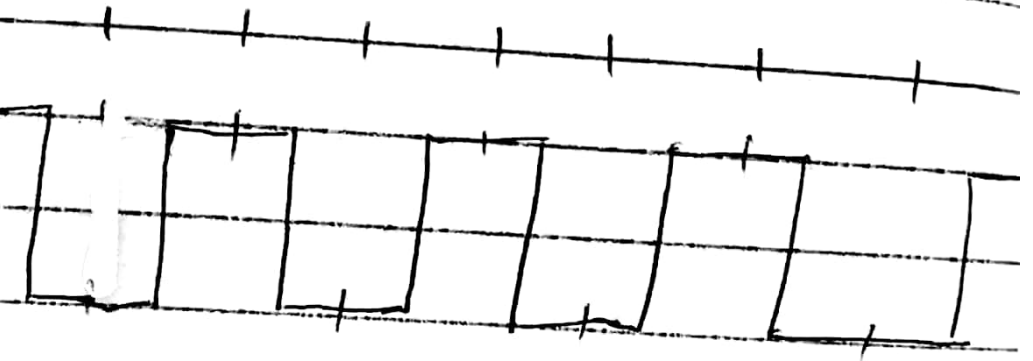
NRZ-L



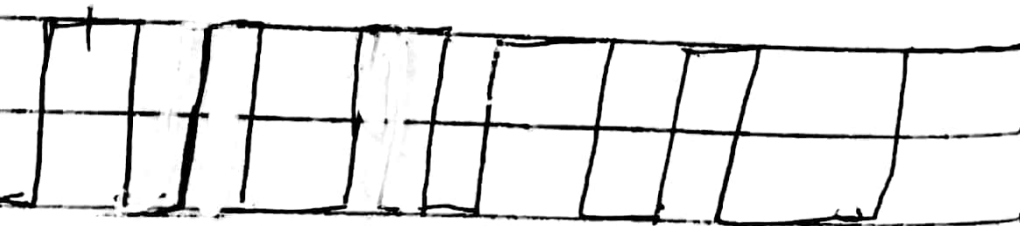
NRZT



Manchester



D Manchester



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Part (c):

Given:

$$B = 950$$

$$f_{min} = 450$$

Sol

$$f_{max} = 950 + 450$$
$$= 1400 \text{ KHz}$$

Nyquist Sampling rate must be 2 times the highest frequency.

$$N = 1400 \times 2$$

$$(N = 2800)$$

Sample per second.

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Q: No: 03:

Part (A):

The middle of the bandwidth is located at 650 KHz means our carrier frequency can be  $f_c = 650 \text{ KHz}$

We can use the baud rate with  $(\alpha = 1)$   $(\gamma = 1)$

$$B = (1 + \alpha) \times S = 2 \times N \frac{1}{8}$$

$$B = 2 \times N = 300 = 2 \times N$$

$$N = \frac{300}{2} = 150$$

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

Part (B):

In the picture Binary Amplitude Shift Keying is used.

In (BASK) we usually use only two levels

Both frequency and phase remain constant where amplitude changes.

~~Binary amplitude shift~~

~~Keying or off keying~~

The peak amplitude of  $1$  signal level is  $0$ .

The other is same as amplitude of carrier frequency.

For  $1$  Amplitude changes  
for  $0$  it remain constant

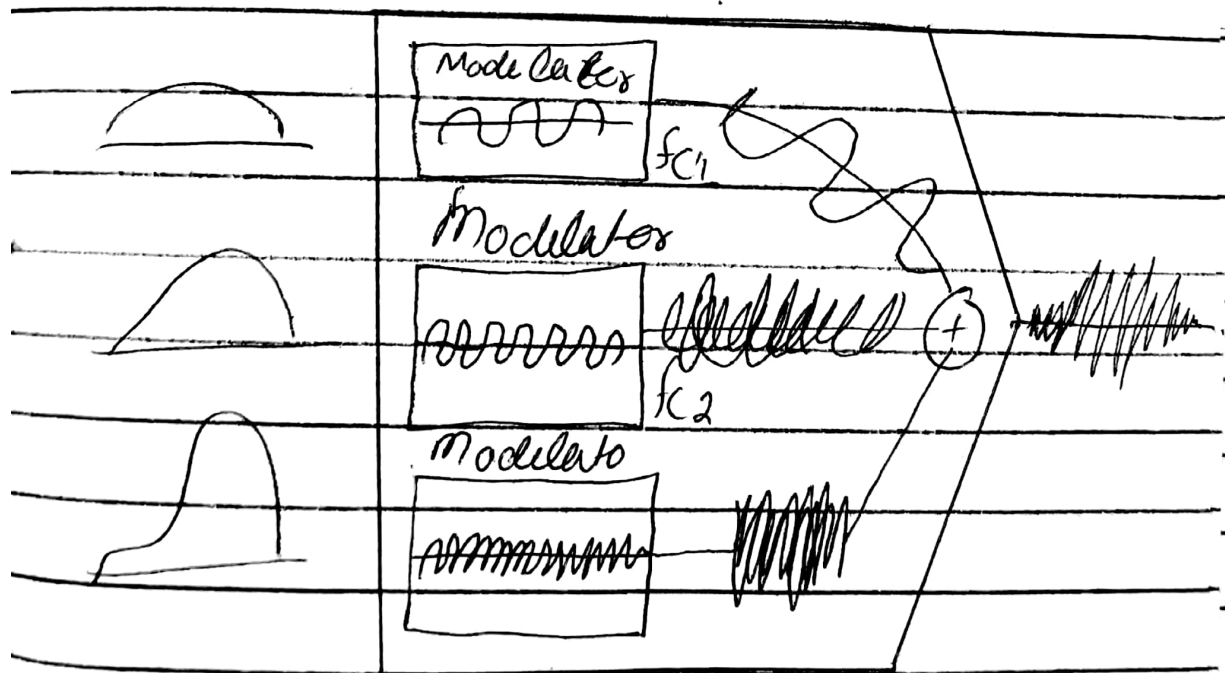
(12)

Q: NO: 04:

Part (A):

FDM:

An analog technique that can be applied when the bandwidth of a link is greater than combined bandwidths of the signal to be transferred.



$\Rightarrow$  Each source generate

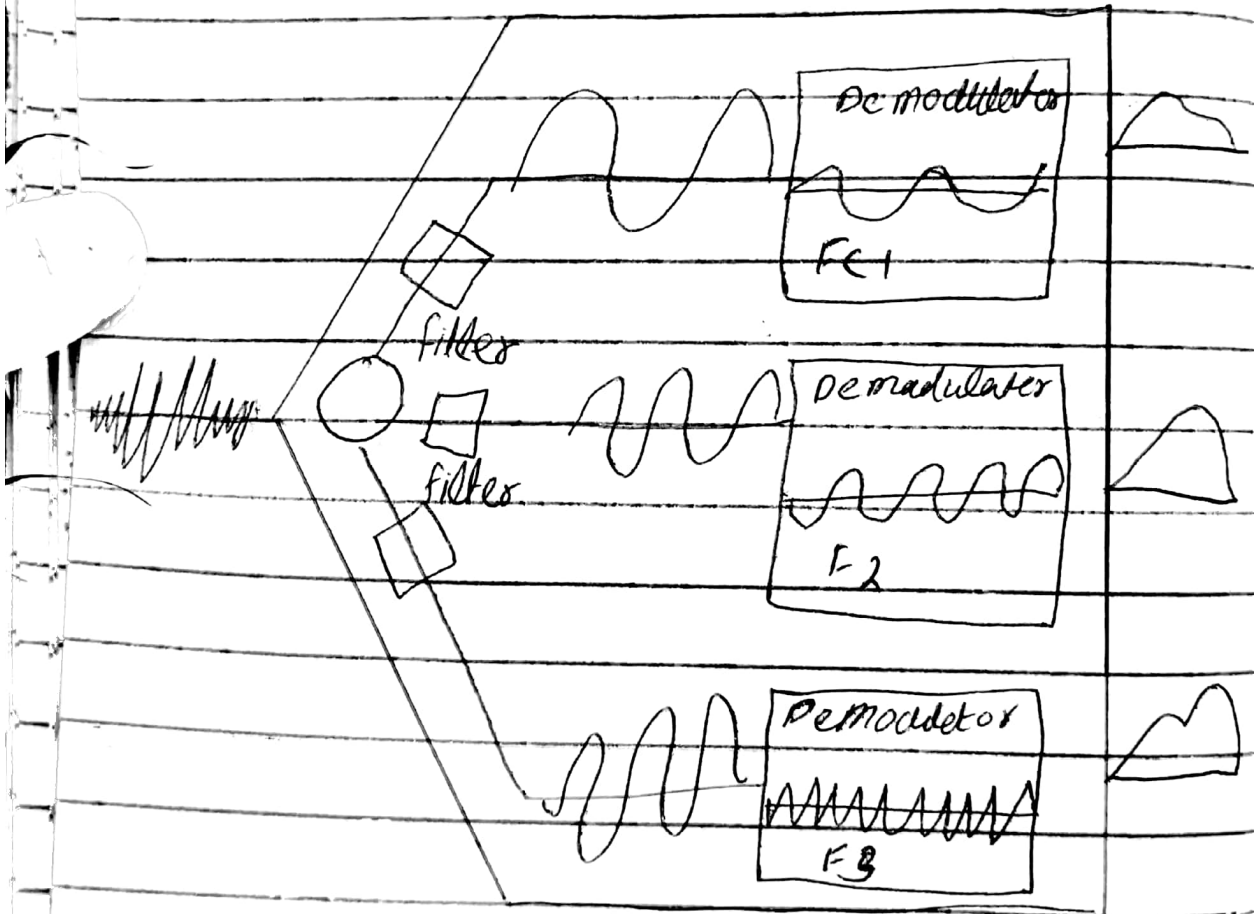
(13)

Signal of similar frequency  
Range

⇒ Inside are 3 Modulators  
with 3 carrier frequencies  
( $f_1, f_2, f_3$ )

⇒ Modulators are combined to  
a single composite signal.

### De Multiplexing:



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⇒ Uses series of filters to decompose the multiplexed signal.

⇒ Individual signals are then passed to a demodulator to separate them from carrier and pass them to output.

### Diff between FDM & TDM

TDM	FDM
use both analog and digital.	use analog transmission system
less complex circuitry than FDM	Circuitry is more complex than TDM
Synchronization is required	Synchronization is not required.
employ pulse code modulation	employ telemetry system, Radio and TV

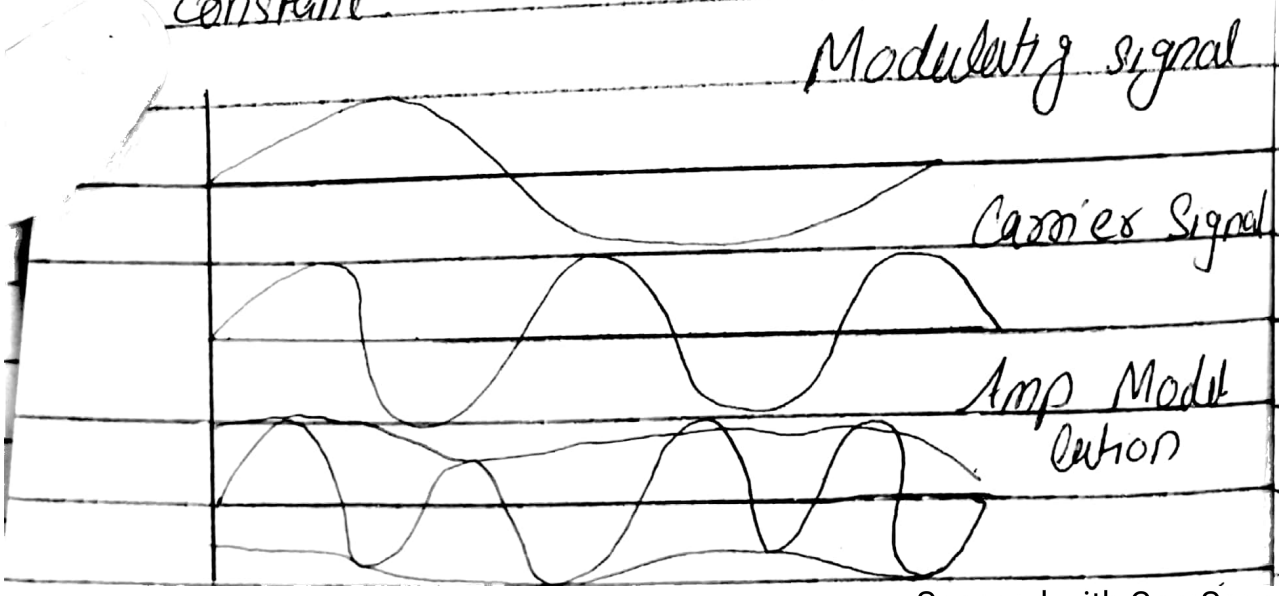
Part (B):

Analogy to Analogy  
Conversion is the representation  
of analog information by  
an analog signal

This modulation can be  
done by three methods.

(1) Amplitude Modulation:

The  
Amplitude of carrier wave  
is varied according to  
instantaneous amplitude of the  
modulating signal keeping  
phase and frequency  
constant.



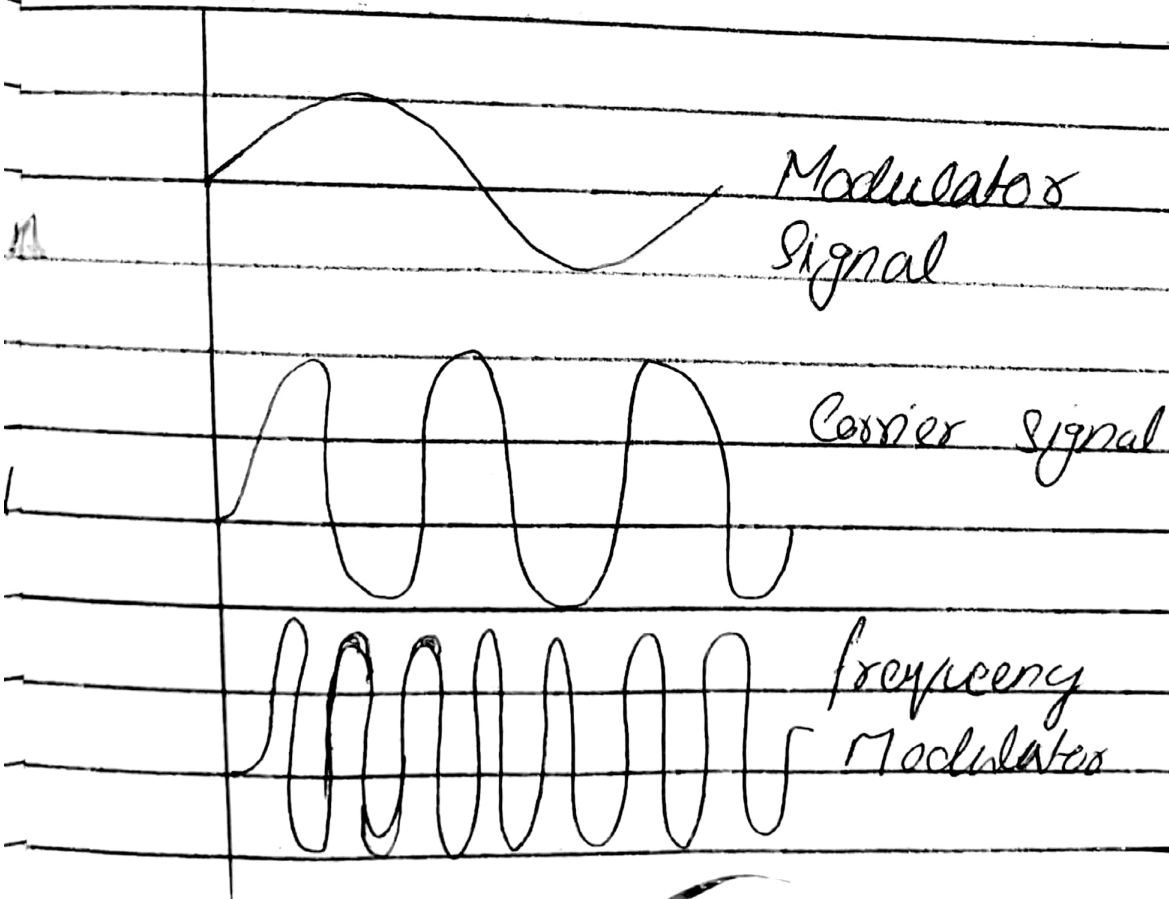


(10)

AM is implemented by using simple multiplexers because Amplitude of carrier signal need to be changed according to amplitude Modulator

(2) Frequency Modulator :

The frequency varies while phase and amplitude remain constant in (FM)



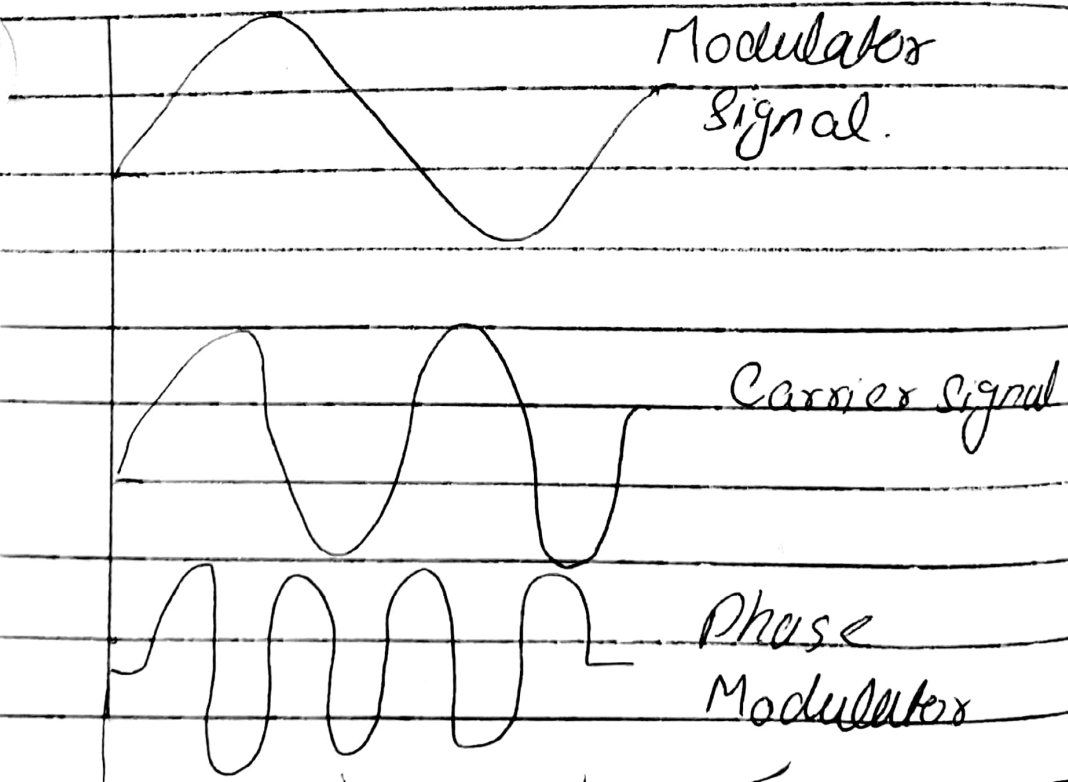
FM is implemented by using voltage-controlled oscillator with FSK.

The frequency of oscillator changes with input voltage which is amplitude of modulator:

Phase Modulator:

In PM

The phase varies where as amplitude and frequency remain the same



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It is practically similar to (FM). But in (PM) the frequency does not increase. It is normally implemented by using oscillators and a voltage - controlled frequency change according to input voltage of derivative which is the amplitude of modulating signal.