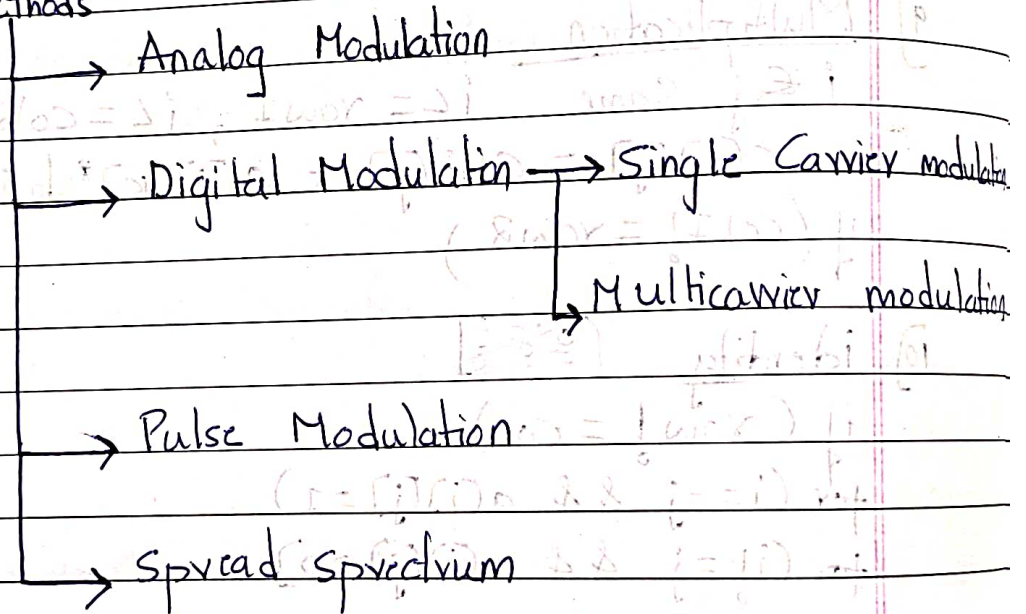


Assignment Work

1) Mention the need for modulation & Compare the basic Modulation is simply a widely used process in Communication Systems. In which the message signals have a very low frequency due to which these signals cannot be transmitted over long distances. Hence modulated over the high frequency carrier signal due to the following reasons:-

- i) Practical Length of Antenna
- ii) Narrow Banding of Signal
- iii) Frequency multiplexing
- iv) Effective Power Radiated by Antenna

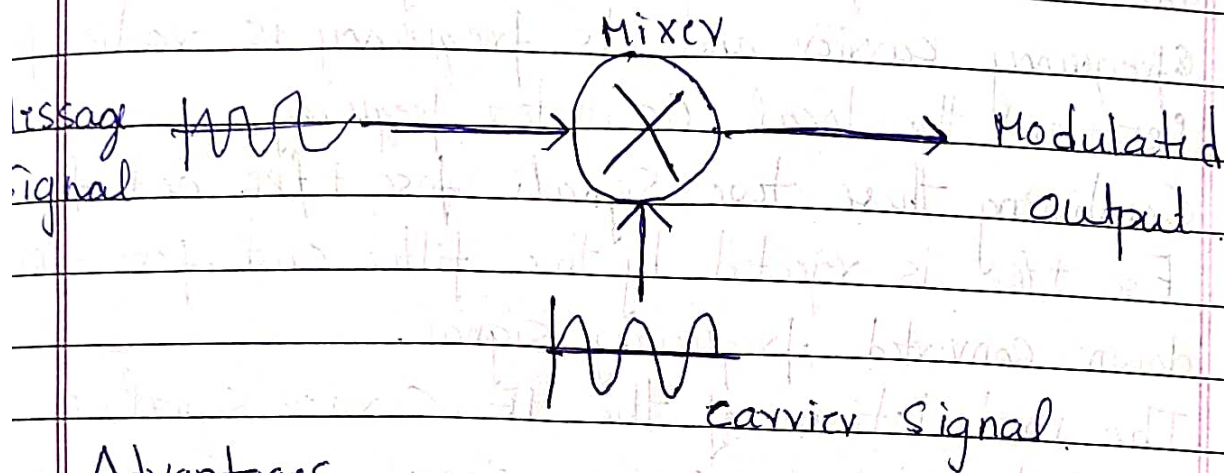
Methods



- 1) Analog modulation :- typically used for AM, FM radio and short wave broadcasting
- 2) Digital ^{Pulse} Modulation :- used to change the pulse width.
- 3) Digital modulation :- involves transmission of binary signals
- 4) Spread spectrum :- Spreads the signals energy over a wide band

3 Explain the methods of Generation of AM(DSBs wave along with their merits & demerits.
DSB-SC is generated by a mixer. This consists of a message signal multiplied by a carrier signal. The mathematical representation of this process is shown below, where the product-to-sum trigonometric identity is used.

$$V_m \cos(\omega_m t) \times V_c \cos(\omega_c t) = \frac{V_m V_c}{2} [\cos(\omega_m + \omega_c)t + \cos(\omega_m - \omega_c)t]$$



Advantages

- * DSB-SC provides 50% modulation efficiency due to the absence of carrier.
- * It consumes less power again due to the absence of carrier in DSB-SC.
- * It provides the large bandwidth due to the presence of two sidebands. The output frequency is twice the frequency of the modulated signal.
- * Low cost

Disadvantages

- * It is complex detection as a wave modulation due to the carrier being suppressed which has its product proportional to the message signal.

4. Explain the working principle of Superhetrodyne receiver.
- * In the Superhetrodyne receiver, the incoming signal through the antenna is filtered to reject the image frequency and then amplified by the RF amplifier.
 - * RF amplifier can be tuned to select and amplify a particular carrier frequency within the AM broadcast range. Only the selected frequency and its two sidebands are allowed to pass through the amplifier.
 - * The carrier of the received signal is called radio frequency carrier and its frequency is radio frequency f_{RF} and the local oscillator frequency f_{osc} .
 - * Combining these two signals $f_{osc} + f_{RF}$ and $f_{osc} - f_{RF}$.
 - * $f_{osc} + f_{RF}$ is rejected by the filter and $f_{osc} - f_{RF}$ is down converted frequency signal.
 - * The modulation of the IF carrier signal is same as that original carrier signal.
 - * This amplified IF signal is applied to the detector to detect the information signal component to reproduce the original information data.
 - * The detector stage eliminates one of the sidebands.
 - * The RF component is filtered out and audio is supplied to the audio stages for amplification.
 - * The generated audio signal is then applied to the AF amplifier to increase the audio frequency level of the signal and to provide enough gain to drive the speaker or headphones.
 - * A speaker is connected to the AF amplifier to play the audio information signal.

6 What are the advantages & disadvantages of linear power supply?

Advantages

- * Simplicity, reliability, low noise levels, low cost.
- * The linear regulators (LR) is simple to design.
- * The performance advantage is relatively noise free.
- * low complexity level does not allow for many issues to arise.

Disadvantages

- * It is ideal for many low-power applications so when a higher power is needed it does not support.
- * Low efficiency
- * high heat loss
- * size issues (large)

7. Discuss the need for UPS & also list the types of UPS.
An Uninterruptible Power Supply, abbreviated as UPS, is a device whose purpose is to provide power to a system when the primary power source fails, or when voltage level of the power source drops below acceptable performance levels.

Types of UPS

- * Standby UPS
- * Line - interactive UPS
- * Standby - ferro UPS
- * Double conversion online UPS
- * Delta conversion online UPS

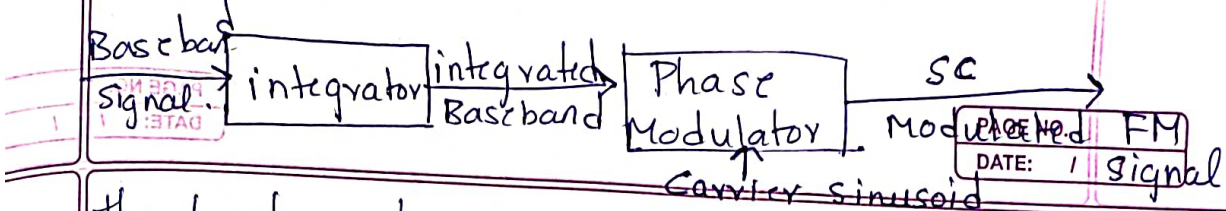
11. Explain the working of CRO
When the electron is injected through the electron gun, it passes through the Control grid. The Control grid controls the intensity of electron in the vacuum tube. If the Control grid has high negative potential, then it allows only a few electrons to pass through it. Thus, the dim spot is produced on the lightning screen. If the negative potential on the control grid is low, then the bright spot is produced. Hence the intensity of light depends on the negative potential of the control grid.

After moving the control grid the electron beam passing through the focusing and accelerating anodes. The accelerating anodes are at a high positive potential and hence they converge the beam at a point on the screen.

After moving from the accelerating anode, the beam comes under the effect of the deflecting plate. When the deflecting plates are at zero potential, the beam produces a spot at the centre. If the voltage is applied to the vertical deflecting plate, the electron beam focuses at the upward and when the voltage is applied horizontally the spot of light will be deflected horizontally.

12. Advantage of frequency modulation over Amplitude modulation.

* The amplitude of an FM wave remains constant over time. This allows the encoders and decoders



the freedom to remove the noise from the received signal.

- * In AM Systems, the power consumption for signal transmission is higher when compared to FM Systems.
- * In AM Systems, the power depends on the modulation index (MA). FM systems, the power of the transmitted signal is proportional to the amplitude of the unmodulated carrier signal & it is constant.
- * In FM Systems, the frequency deviation of the signal is related to the noise ratio, whereas in AM systems, the only method of reducing the noise in the transmission is the increase in the transmitted power of the signal.

12 Measurement of Amplitude

CRO displays the Voltage signal as a function of time on its screen. The amplitude of that voltage signal is constant, but we can vary the no. of divisions that cover the voltage signal in vertical direction by varying volt/division knob on the CRO panel. $A = j \times nv$

Where :- * A is the amplitude

* j is the value of volt/division

* nv is the no. of divisions

Measurement of Time period

We can vary the no. of divisions that cover one complete cycle of voltage signal in horizontal direction by varying time/division knob on the CRO panel.

$$T = K \times n_h$$

T = Time period

T = time/division

n_h = no. of divisions that cover one complete cycle of the periodic signal in horizontal direction.

Measurement of Frequency

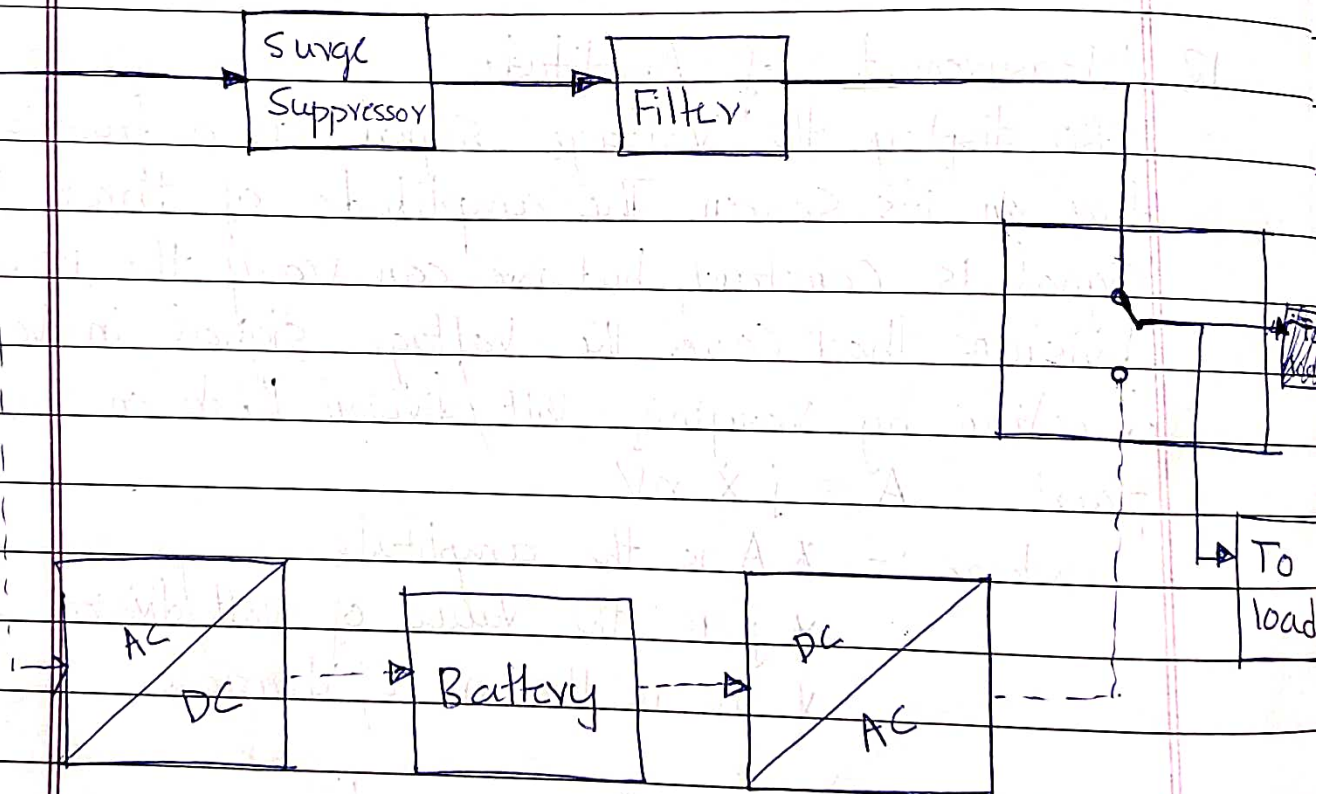
Reciprocal of time period

$$F = 1/T$$

Step 1:- Find the time period (T) of periodic signal.

Step 2:- Take reciprocal of time period signal.

9. Draw the block diagram of offline UPS and explain.

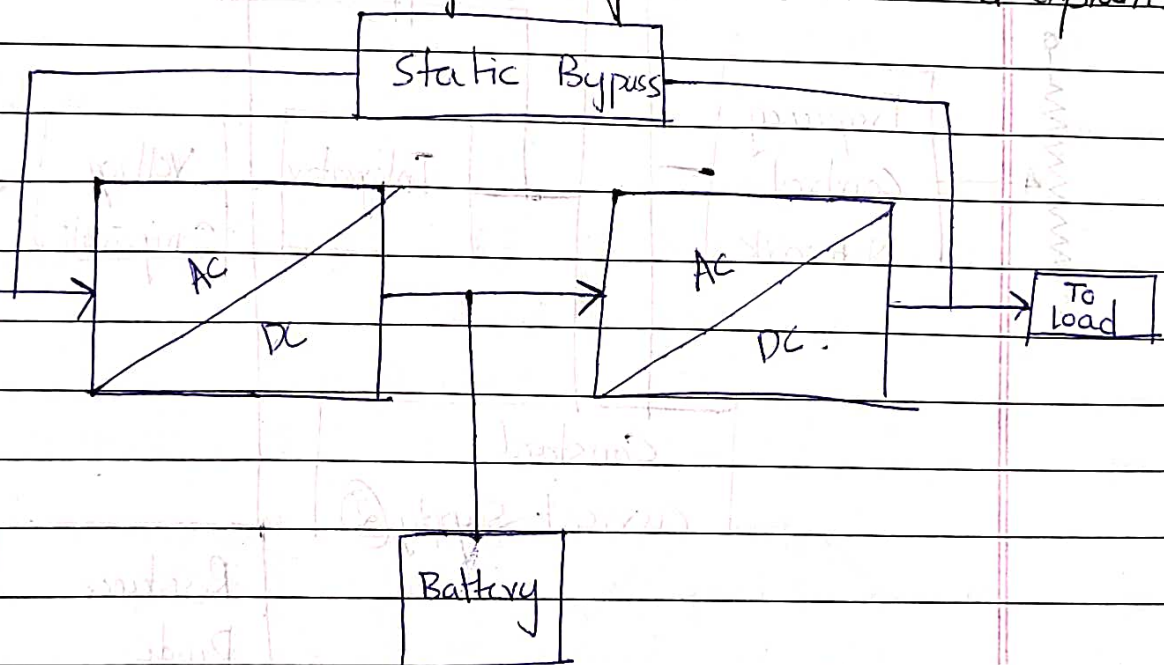


This UPS is also called as standby UPS System which can give only the most basic features. Here, the primary source is the filtered AC mains. When the power breakage occurs,

the transfer switch will select the backup source. Thus, we can clearly see that the standby system, the AC voltage is first rectified and stored in the storage battery connected to the rectifier.

When the power breakage occurs, this DC voltage is converted to AC voltage by means of a power inverter and is transferred to the load connected to it.

Q. Draw the block diagram of online UPS and explain.

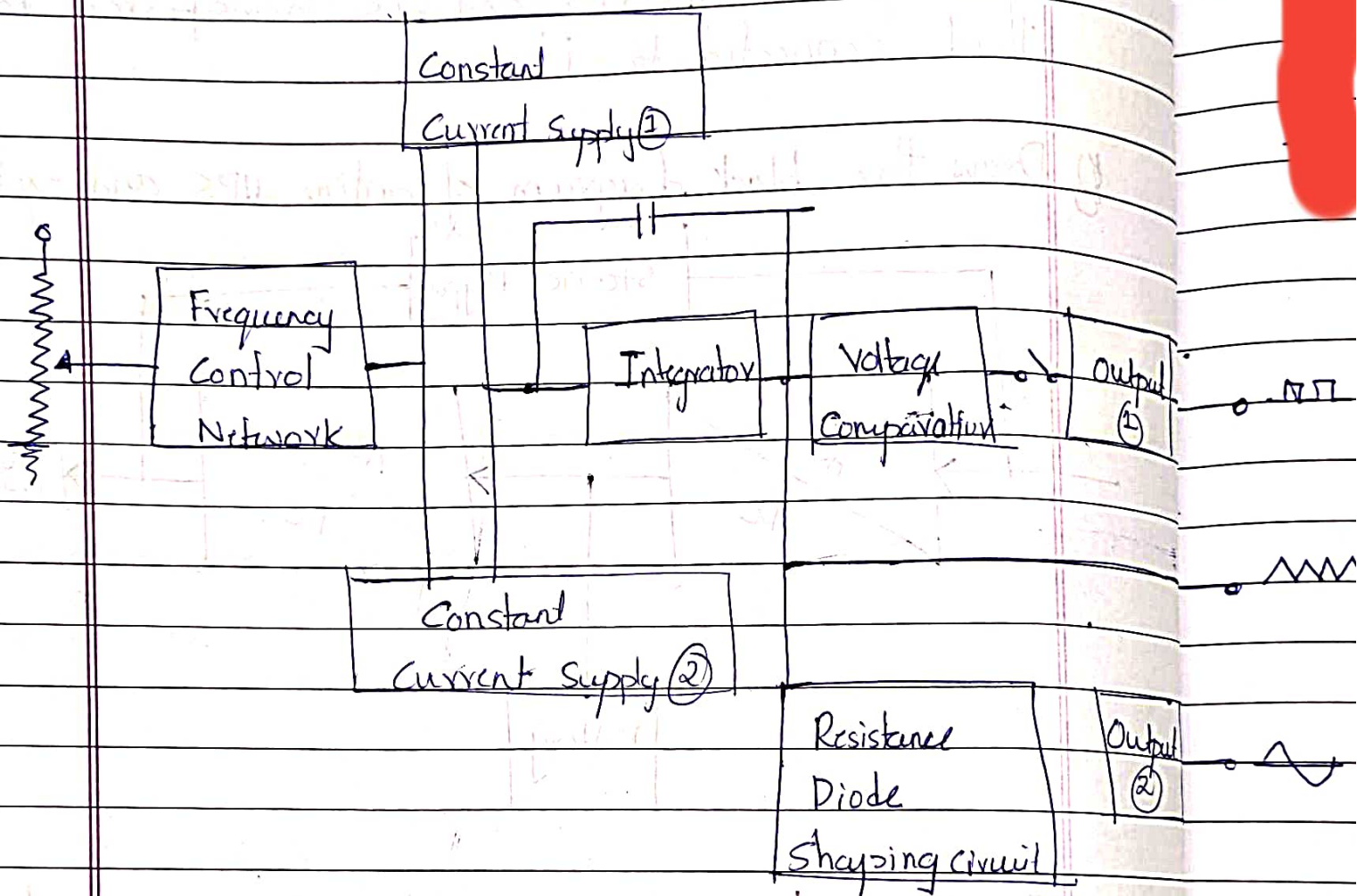


In this type of UPS, double conversion method is used. Here, first the AC input is converted into DC by rectifying process for storing it in the rechargeable battery. This DC is converted into AC by the process of inversion and given to the load which it is connected. This type of UPS is used where electrical isolation is mandatory.

When there is any power failure, the rectifier has no role in the circuit and the steady power stored in batteries is connected to the

Inverter is given to the load by means of transfer switch. Once the power is restored the rectifier begins to charge the batteries.

10 Draw the block diagram of electronic generator and explain in brief.



5. $E_{max} = 110 \text{ V}$

$E_{min} = 90 \text{ V}$

$f_c = 1.2 \text{ MHz}$

$f_m = 20 \text{ KHz}$

Modulation index

$$M_a = \frac{E_{max} - E_{min}}{E_{max} + E_{min}} = \frac{110 - 90}{110 + 90} = 0.1 \text{ or } 10\%$$

Unmodulated Carrier amplitude

$$E_{\max} = A_c(1 + m_a)$$

$$110 = A_c(1 + 0.1)$$

$$A_c = \frac{110}{1.1} = 100 \text{ Volts}$$

$$\therefore A_c = 100 \text{ Volts}$$

$$\rightarrow \text{Amplitude} = \frac{\mu A_c}{2} = \frac{10 \times 10}{2} = 50 \text{ V}$$

$$\rightarrow \text{Original Carrier} = 1.2 \text{ MHz}$$

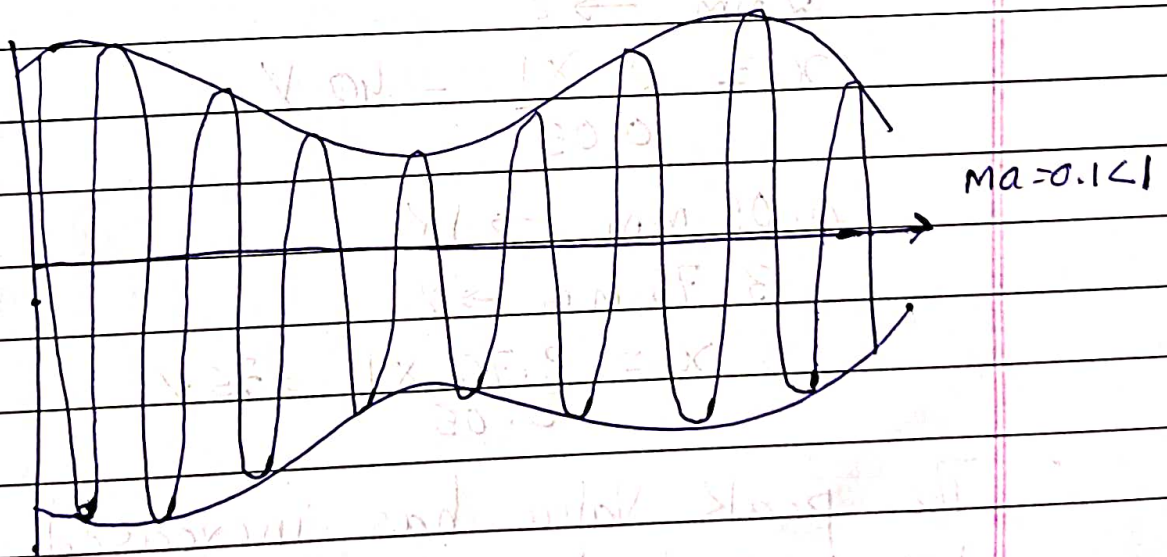
$$\text{Upper side band} = 1.2 + 0.02 \\ = 1.22 \times 10^6 \text{ Hz}$$

$$\text{Low side band} = 1.2 - 0.02 \\ = 1.18 \times 10^6 \text{ Hz}$$

$$\text{Modulation} = 20 \times 10^3$$

$$= 0.02 \times 10^6 \text{ Hz}$$

Waveform



$$14 \quad 6 \text{ cm} \rightarrow 100 \text{ V}$$

$$x \rightarrow 1 \text{ V}$$

$$x = \frac{6 \times 1}{100} = 0.06$$

∴ Sensitivity is $0.06 \text{ cm} \rightarrow 1 \text{ V}$

$9 \text{ cm} \rightarrow ?$

$$x = \frac{9 \times 1}{0.06} = 150 \text{ V}$$

∴ The peak value of this Voltage is 150 V

15. $0.05 \text{ mm} \rightarrow 1 \text{ V}$

$x \rightarrow 300 \text{ V}$

$$\frac{0.05}{x} = \frac{1}{300}$$

$$x = 0.05 \times 300$$

$$= 1.5 \text{ mm//}$$

16. $0.05 \text{ mm} \rightarrow 1 \text{ V}$ is the Sensitivity

Spot shift $\rightarrow 3.75 - 2$

$$= 1.75 \text{ mm}$$

$0.05 \text{ mm} \rightarrow 1 \text{ V}$

$2 \text{ mm} \rightarrow ?$

$$x = \frac{2 \times 1}{0.05} = 40 \text{ V}$$

$0.05 \text{ mm} \rightarrow 1 \text{ V}$

$3.75 \text{ mm} \rightarrow ?$

$$x = \frac{3.75 \times 1}{0.05} = 75 \text{ V}$$

∴ The peak value has increased upto 35
for a spot shift $= 1.75 \text{ mm}$