GROUND WAVE, SKY WAVE AND SPACE WAVE PROPAGATION

Aspect	Ground Wave Propagation	Sky Wave Propagation	Space Wave Propagation
Definition	Waves travel along the surface of the Earth.	Waves are reflected back to Earth by the ionosphere.	Waves travel directly through the atmosphere.
Frequency Range	Up to 3 MHz (low and medium frequencies)	3 MHz to 30 MHz (high frequencies)	Above 30 MHz (very high to ultra-high frequencies)
Distance Coverage	Short to medium-range (up to a few hundred km)	Long-range (can cover thousands of km)	Line of sight (a few km to about 100 km)
Attenuation	High attenuation due to ground absorption	Moderate attenuation due to ionospheric absorption	Low attenuation; limited by curvature of Earth
Best Used For	AM radio, maritime communication	Shortwave radio, international broadcasting	TV broadcasting, mobile communications, satellite communication
Affected By	Ground conductivity, obstacles	Solar activity, time of day (night vs. day)	Line-of-sight obstacles (hills, buildings)
Wave Path	Travels along the surface	Travels to the ionosphere and is reflected back	Travels straight from transmitter to receiver

EXPLAIN ADM IN DETAILS

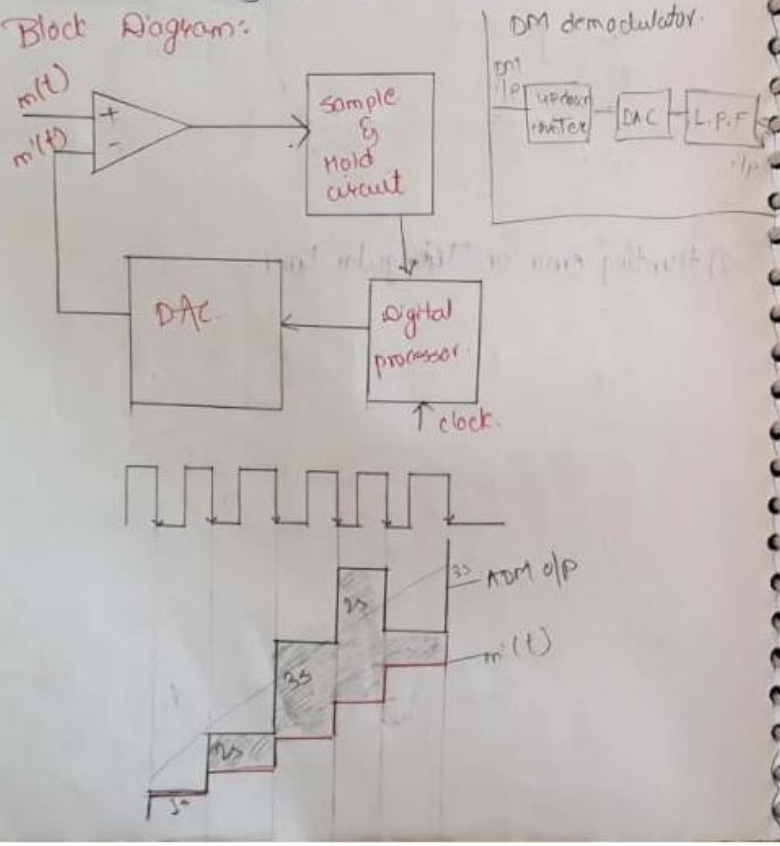
Adaptive DM (ADM)

The problems of DM are overcome by ADM where we are replacing up/down counter by highly intelligent digital processor which is having accumulator inside it.

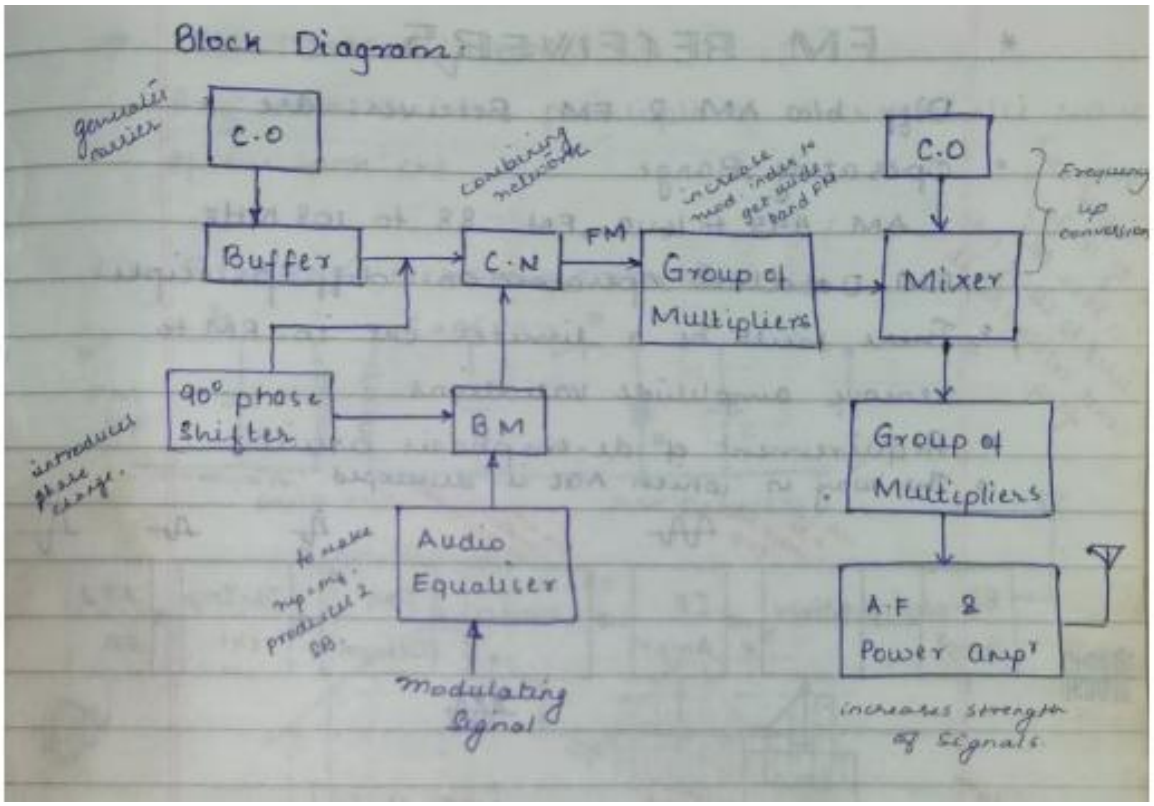
If signal does not catches with $m'(t)$ instead of incrementing step size by 1 we increement it by twice. If still it does not catches we increment it by three in this process approximated signal try to catches original signal fast.

Thus reducing quantization error.

Block Diagram:



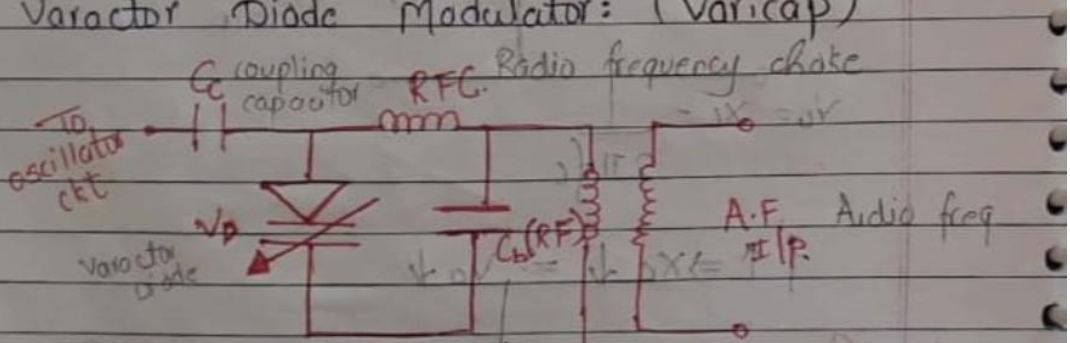
ARMSTRONG METHOD TO GENERATE FM



VARACTOR DIODE MODULATOR TO GENERATE FM

DIRECT METHOD:

Varactor Diode Modulator: (Varicap) (variable capacitance)



used to bias the -ve voltage in reverse bi

35 / 54

$-V_b$ is used to bias varactor diode in Reverse bias condn so that it provides junction capacitance effect.

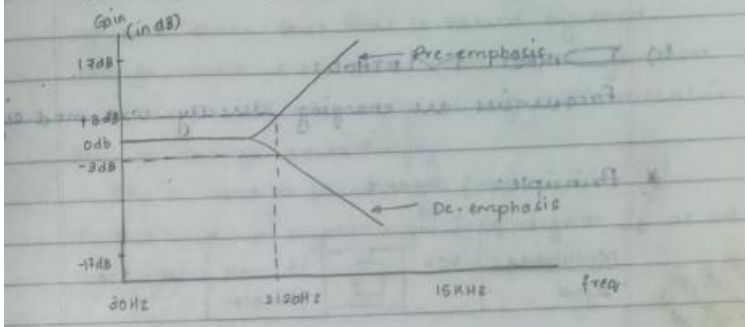
RFC is used to block carrier frequency entering into modulating signal.

If some RF manage to pass RFC. they are grounded by bypass capacitor.

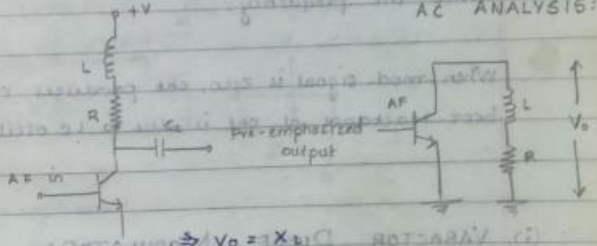
As modulating signal changes, reactance of varactor diode changes & hence total reactance changes ∴ the frequency changes.

PRE EMPHASIS DE - EMPHASIS

EMPHASIS CURVE:



PRE-EMPHASIS CIRCUIT:

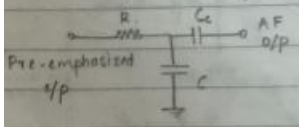


$\Rightarrow V_o = X_L$

$= 2\pi f L$

As f ↑, X_L ↑, V_o ↑ (desired)

DE-EMPHASIS CIRCUIT:



$V_o = X_c = \frac{1}{2\pi f C}$

As f ↑, X_c ↓, V_o ↓

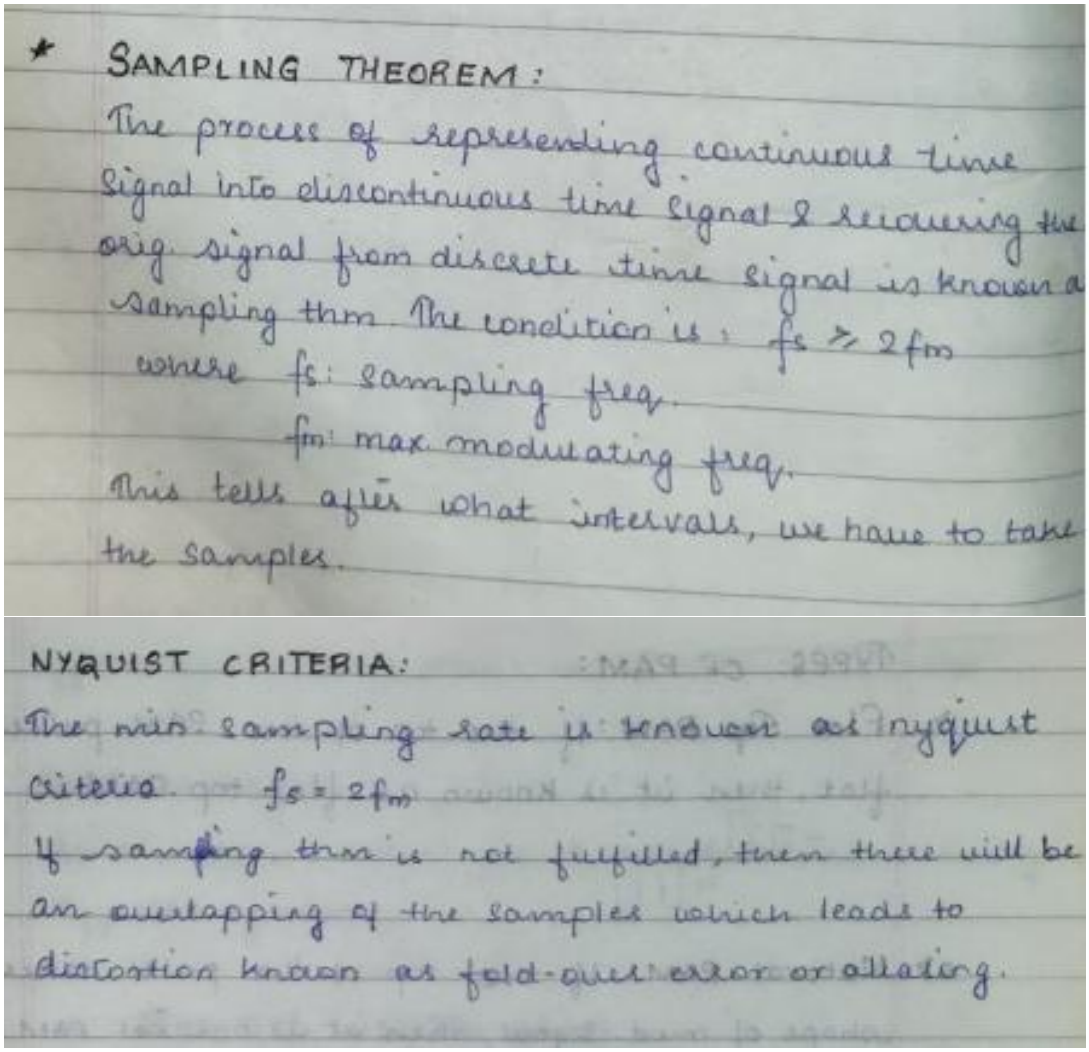
Pre Emphasis: Artificially boosting higher audio frequencies at the transmitter with standard pre determined curve.

De-Emphasis: The artificially boosted signal at the transmiter must be brought to its original value which is known as de-emphasis.

OR

compensation done at receiver is known as de-emphasis.

SAMPLING THEOREM AND NYQUIST CRITERIA



* SAMPLING THEOREM:

The process of representing continuous time signal into discontinuous time signal & recovering the orig. signal from discrete time signal is known a sampling thm. The condition is: $f_s \geq 2f_m$

where f_s: sampling freq.

f_m: max. modulating freq.

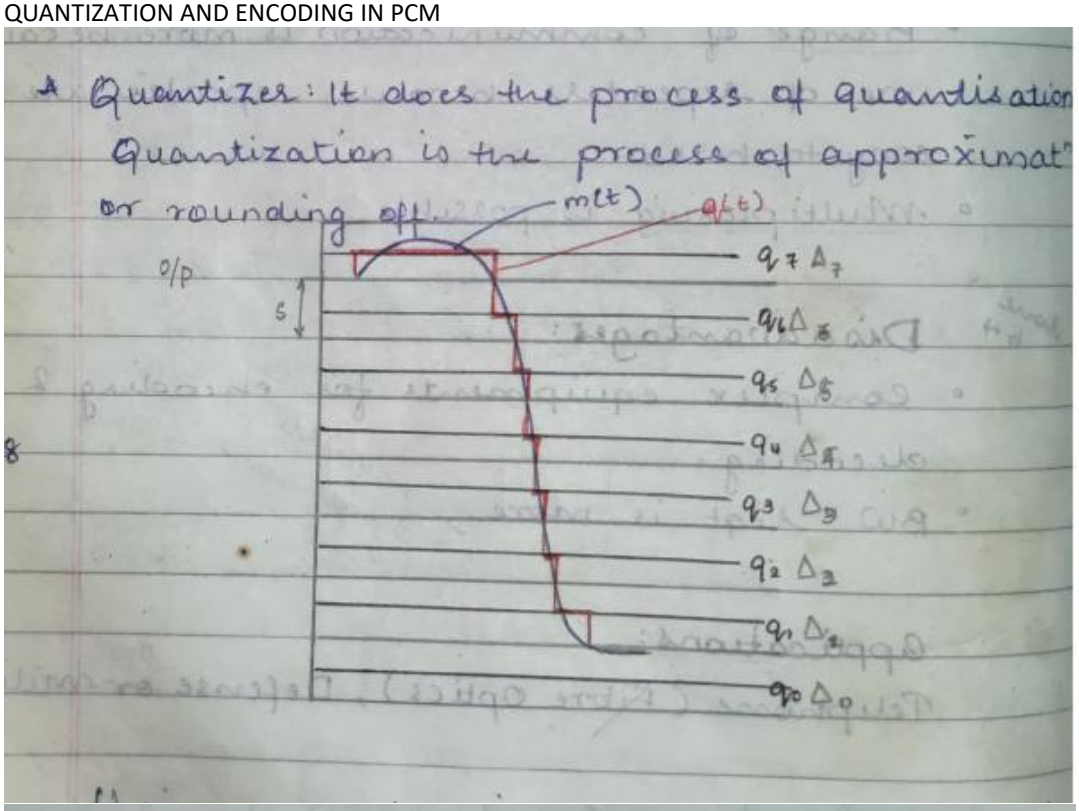
This tells after what intervals, we have to take the samples.

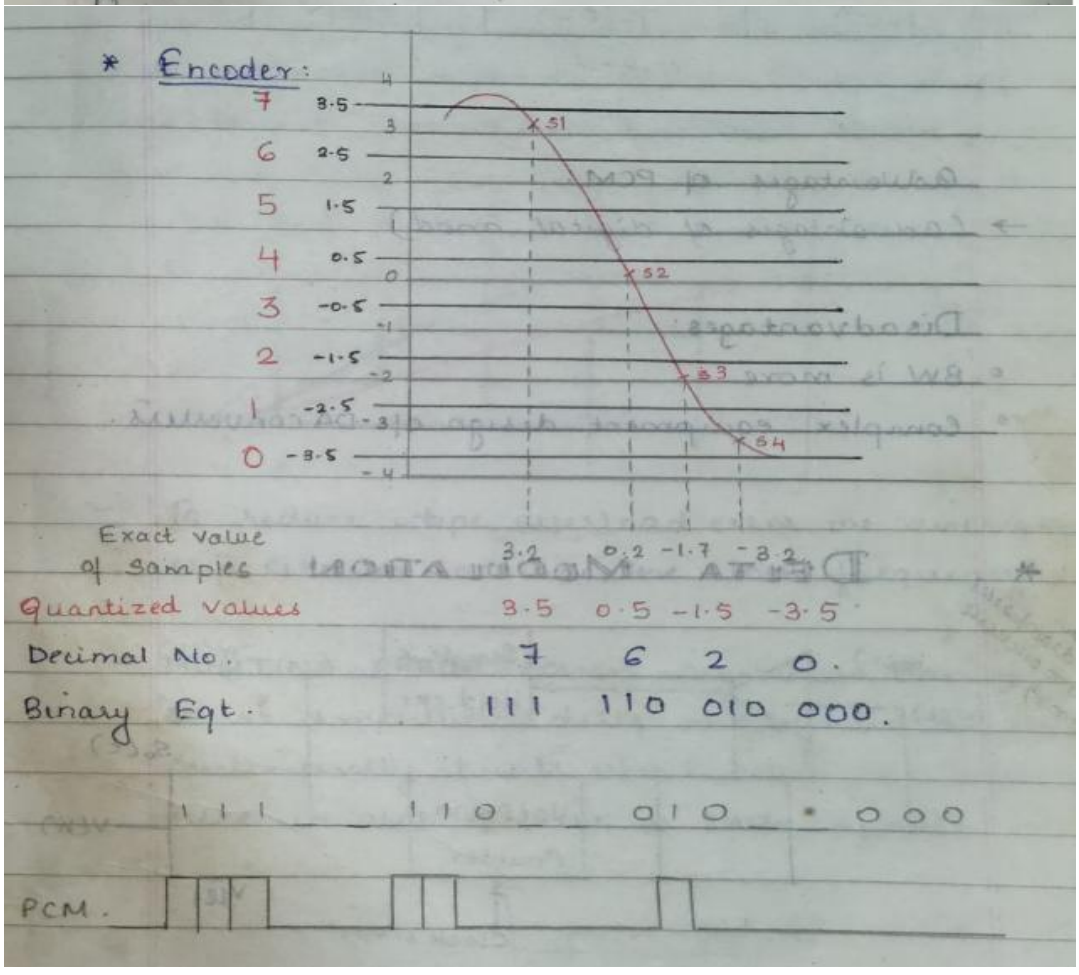
NYQUIST CRITERIA:

The min sampling rate is known as nyquist criteria. $f_s = 2f_m$

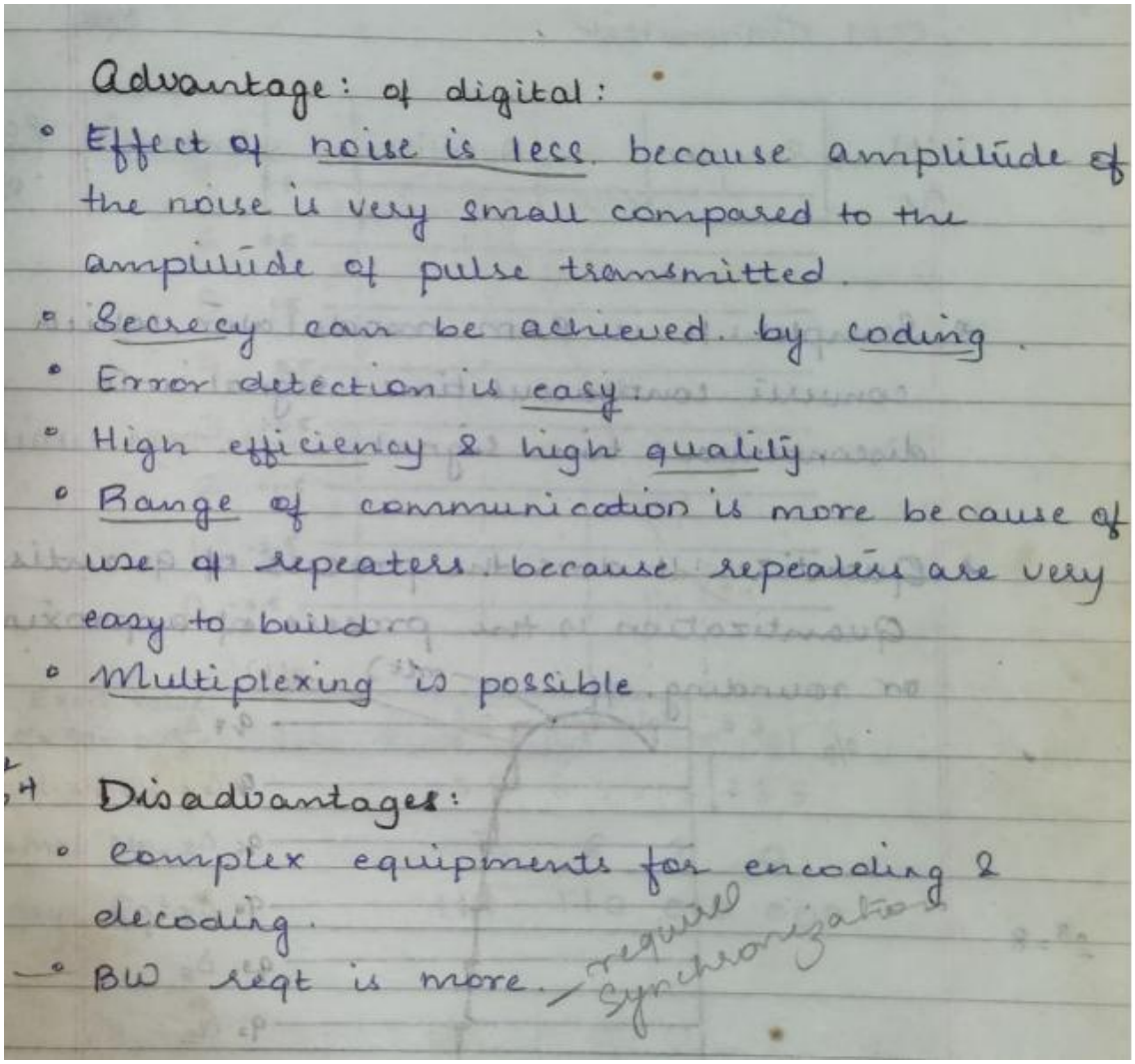
If sampling thm is not fulfilled, then there will be an overlapping of the samples which leads to distortion known as fold-over error or aliasing.

QUANTIZATION AND ENCODING IN PCM





ADVANTAGE AND DISADVANTAGE DIGITAL COMMUNICATION



Advantage: of digital:

- Effect of noise is less because amplitude of the noise is very small compared to the amplitude of pulse transmitted.
- Secrecy can be achieved by coding.
- Error detection is easy.
- High efficiency & high quality.
- Range of communication is more because of use of repeaters. because repeaters are very easy to build.
- Multiplexing is possible.

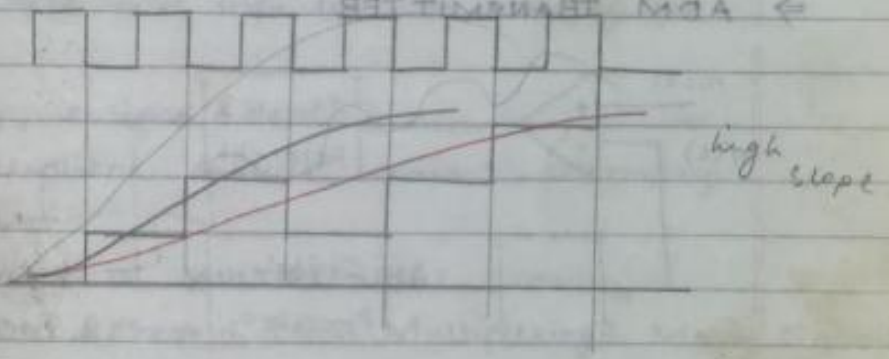
Disadvantages:

- Complex equipments for encoding & decoding.
- BW req is more. / requires synchronization

SLOPE ERROR HUNTING ERROR

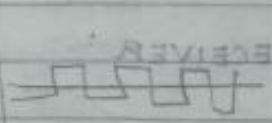
Drawbacks of Delta Modulation:

- **Slope Overload Error:** Whenever signal is having high slopes, then approximated signal $m'(t)$ is totally diff. from the orig. signal i.e. quantization error is more. This type of error is known as slope overload error.



- To reduce slope overload error, we increase step size or increase the clock frequency.

- **HUNTING ERROR:** When signal is having const amplitude, delta modulated amplitude continuously hunts abv & below the signal, ∴ there is alot of error in such signals.

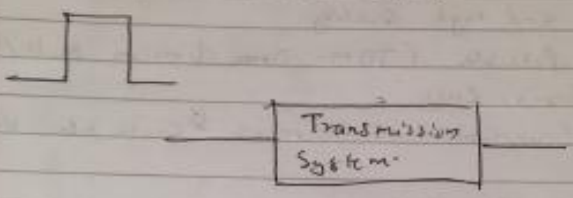


SHORT NOTE ON ISI

Q 9 Write Short note on ISI

→ i) ISI Stands for Inter Symbol Interface

ii) When data is being transmitted in the form of pulses the o/p produced at the reciver due to other bit or Symbol interferes with output Produced by desired bit this is Called ISI



Effect of ISI

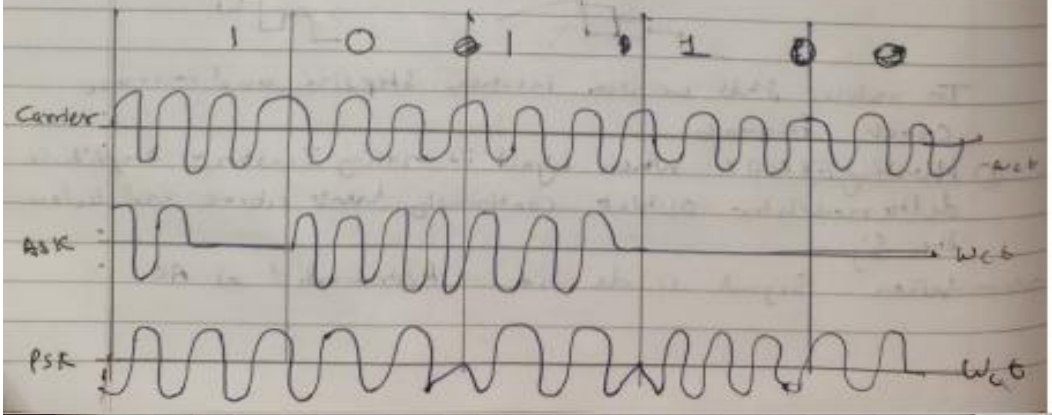
i) Error get more

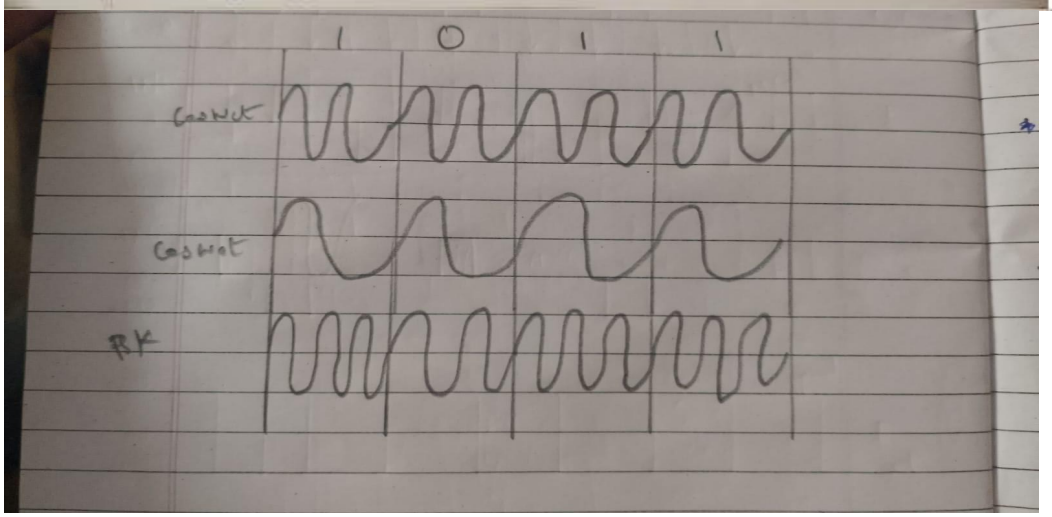
ii) Cross Stock

* Causes of ISI :- Overall frequency response of the System is never Perfect

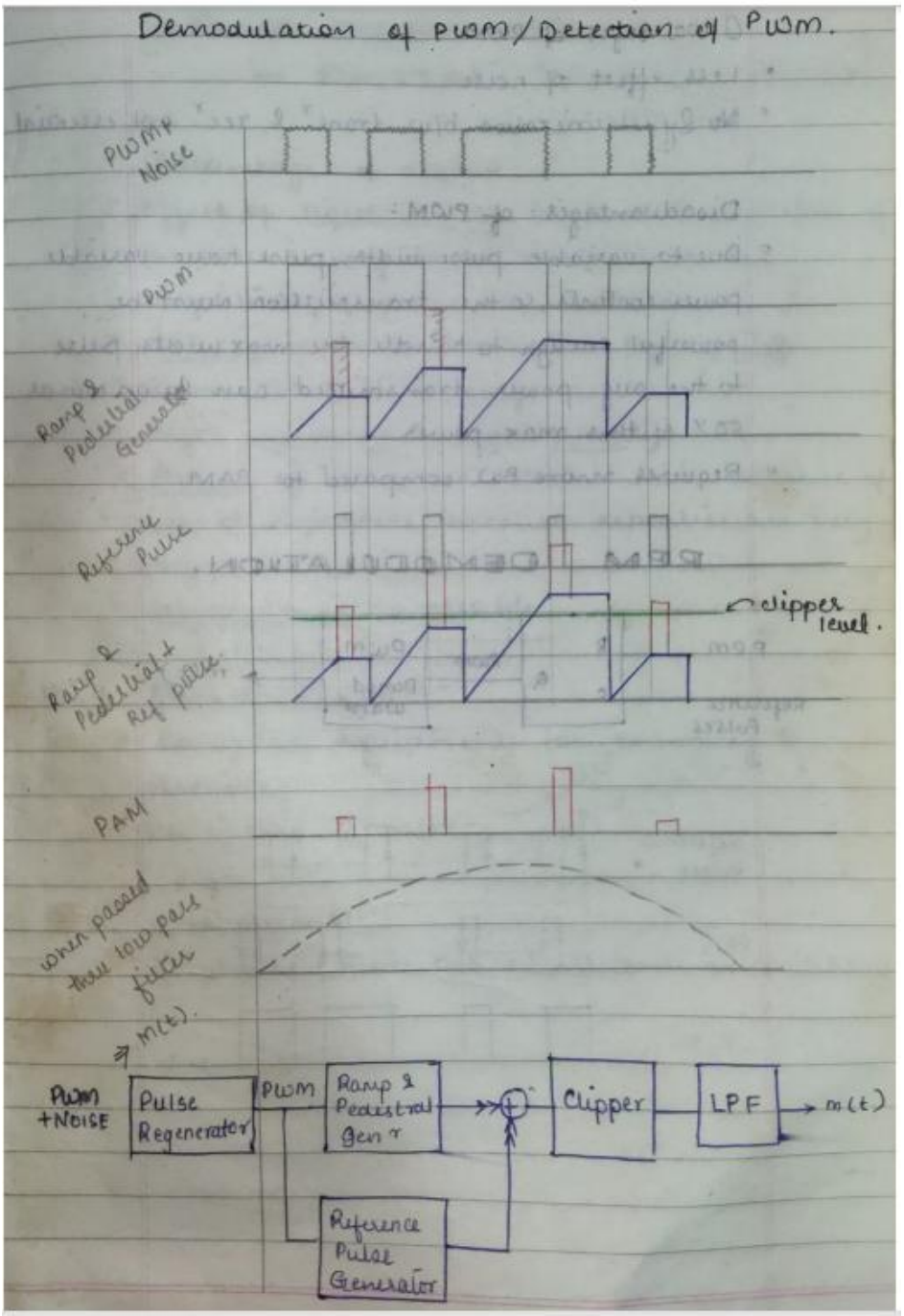
Remedy :- Instead of Pulse Send Sinc function

- I Pattern or Idiagram is used to measure ISI

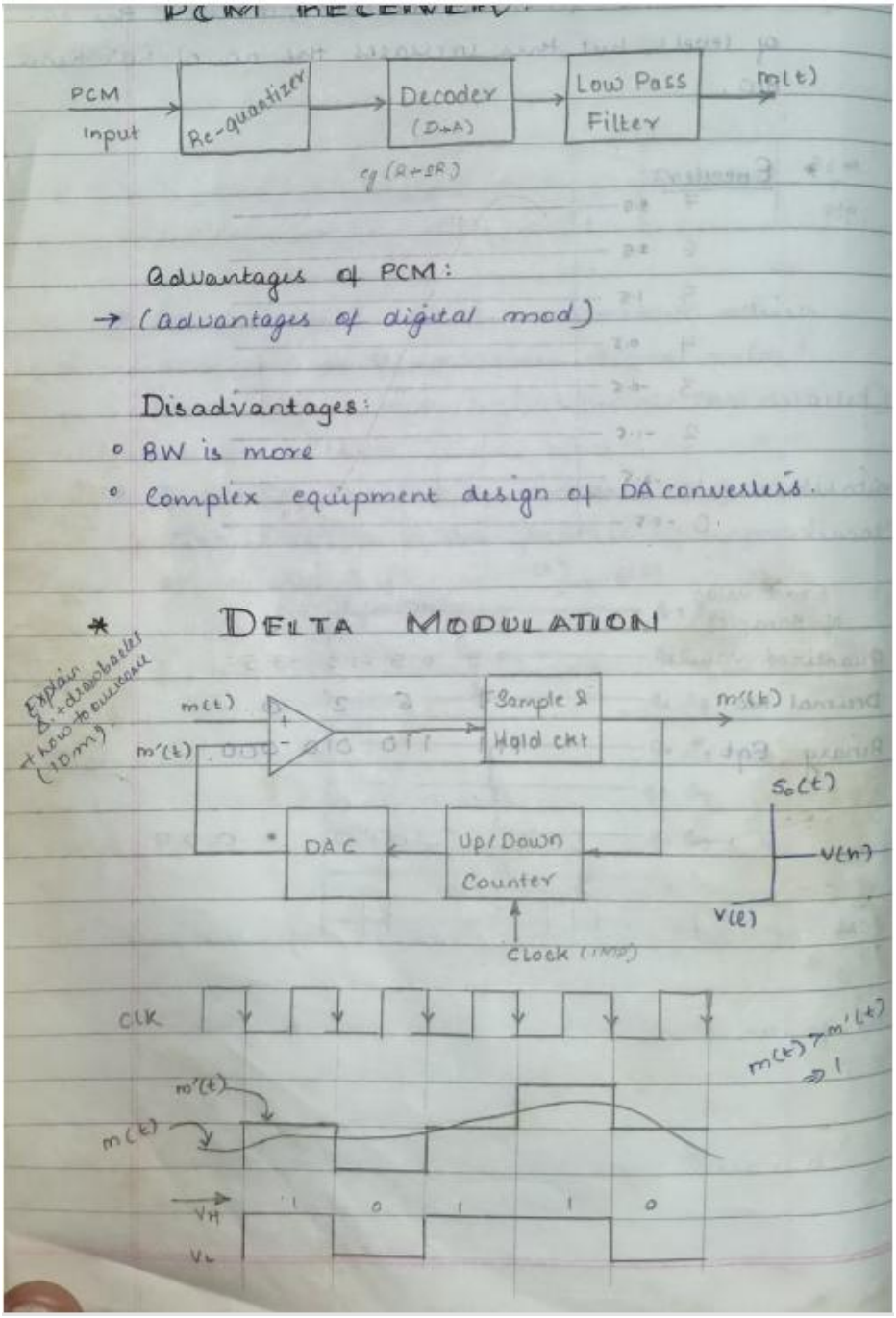




PWM DEMODULATOR WAVEFORM



DRAWBACKS OF DELTA MODULATION.HOW TO OVERCOME THESE DRAWBACK



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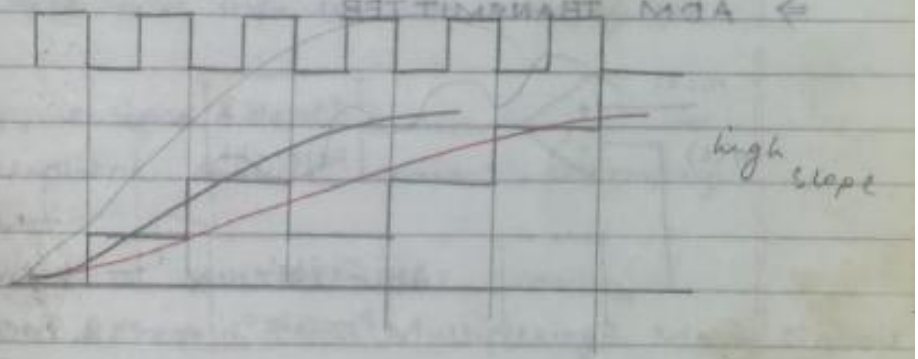

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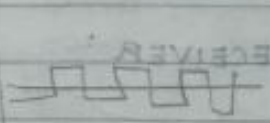
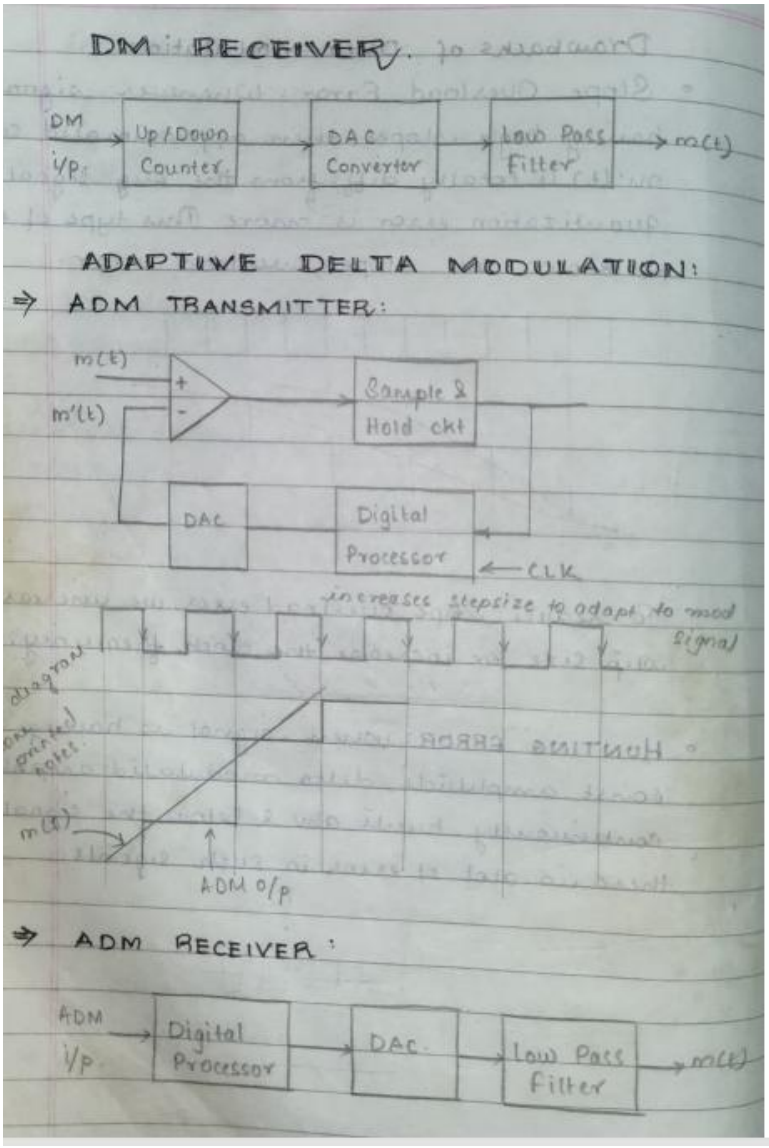
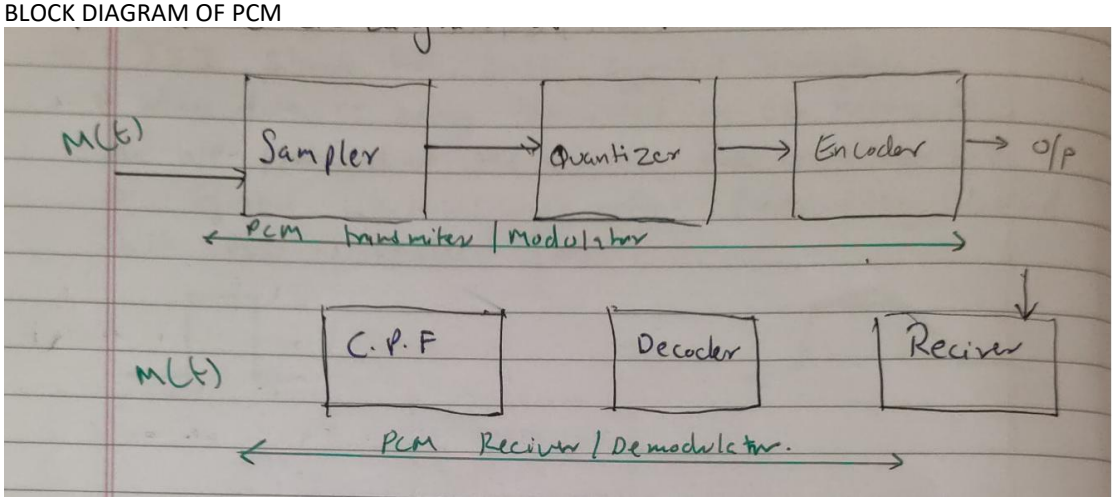
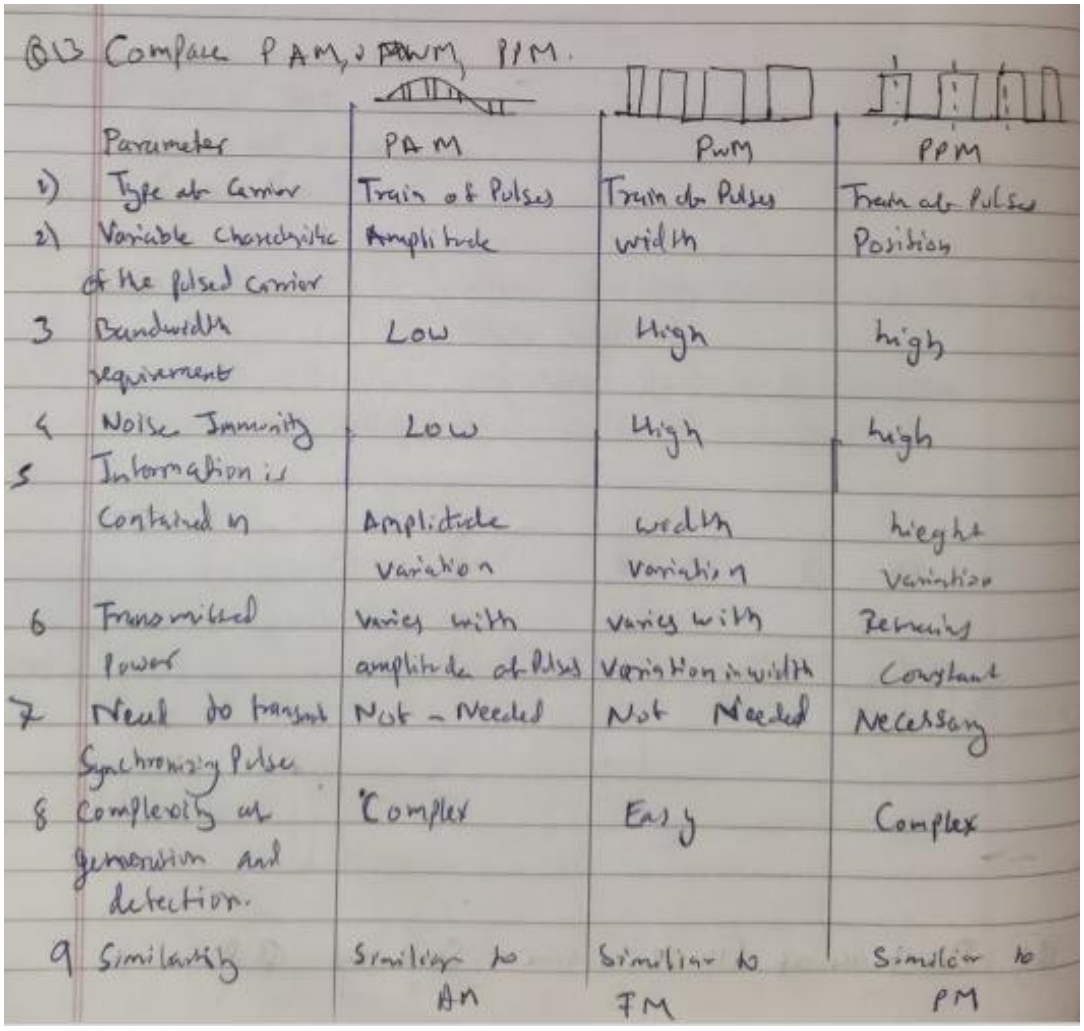




BLOCK DIAGRAM OF PCM



COMPARE PAM PWM PPM



Q13 Compare PAM, PWM, PPM.

	Parameter	PAM	PWM	PPM
1)	Type of Carrier	Train of Pulses	Train of Pulses	Train of Pulses
2)	Variable characteristic of the pulsed carrier	Amplitude	width	Position
3	Bandwidth requirement	Low	High	high
4	Noise Immunity	Low	High	high
5	Information is Contained in	Amplitude variation	width variation	height variation
6	Transmitted Power	Varies with amplitude of Pulses	Varies with Variation in width	Remains Constant
7	Need to transmit Synchronizing Pulse	Not - Needed	Not Needed	Necessary
8	Complexity of generation and detection.	Complex	Easy	Complex
9	Similarity	Similar to AM	Similar to FM	Similar to PM