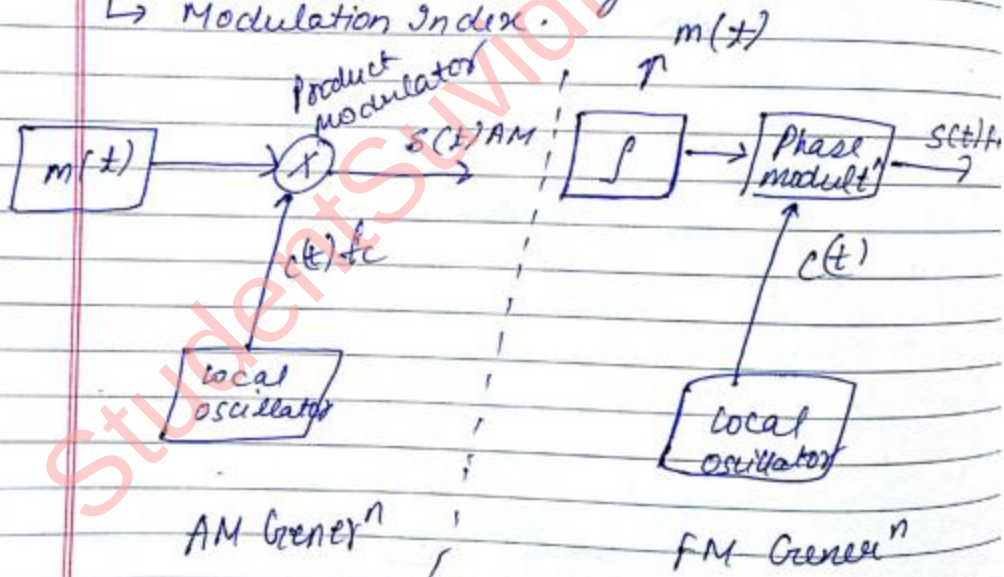
20/8/14

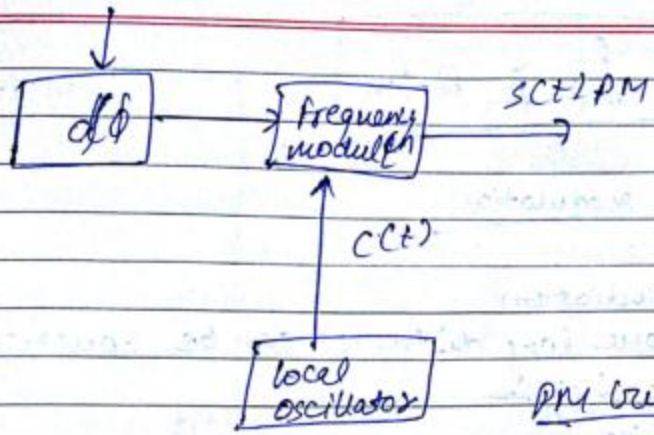
# Section B

↳ Modulation
↳ Need of modulation
↳ Modulation

AM FM PM

↳ Modulation S/g
↳ Carrier S/g
↳ Modulation Block Diagram
↳ Modulation Index.






PM Generation

Modulation is the process or technique in which some parameter of carrier signal is varied acc. to the modulating signal the parameters may be amplitude, frequency, or phase.

Msg. ←

Amplitude Modulation Amplitude is varied acc to modulated signal, and phase and frequency get constant

Frequency Modulation frequency is varied acc to modulated signal, and amplitude & phase get constant

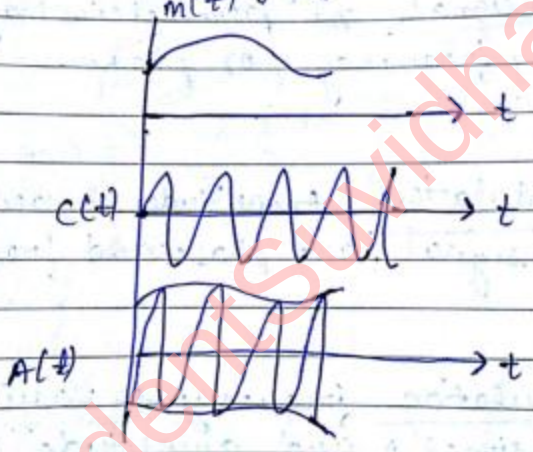
Phase Modulation phase is varied acc to the modulated signal, and amplitude & frequency gets constant

$$f_c \geq 2 \cdot f_m$$

## Need Of modulation

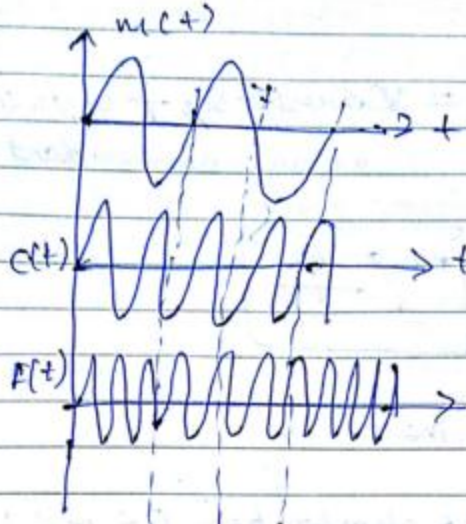
- ease of radiation
- much more long distance can be covered.
- antenna height
- multiplexing

## AM through Analog signal




## FM

FM




~~Modulated Index~~ :

AM

$S(t)_{AM} = ?$

$V_m$ & $V_c$ amplitude of message & carrier signal

$w_c$ & $w_m$ angular speed.

let $m(t) = V_m \sin w_m t$

$c(t) = V_c \sin w_c t$

$s(t)_{AM} = V_c \sin w_c t + V_m \sin_m t \sin \omega t$

$\frac{V_m}{V_c} = m$

$S(t)_{AM} = V_c \sin w_c t + \frac{V_m}{2} \cos(w_c - w_m) + \frac{V_m}{2} \cos(w_c + w_m)$

$= V_c \left( \sin w_c t + \frac{V_m}{2V_c} \cos(w_c - w_m) + \frac{V_m}{2V_c} (w_c + w_m \right.$

LP UP

$\left. = V_c \left( \sin w_c t + \frac{m}{2} \cos(w_c - w_m)t + \frac{m}{2} (\cos(w_c + w_m \right) \right.$

m = modulation index

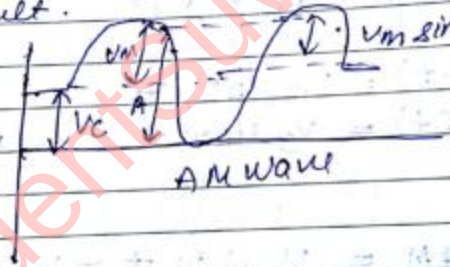
$s(t)$ = Carrier sig + upper side band component + lower side band component

$$M = \frac{V_m}{V_c}$$

## Modulation Index (m)

(i) It should be $0 < M \leq 1$

If $M > 1$, over modulation occur & recovery of message signal become difficult.



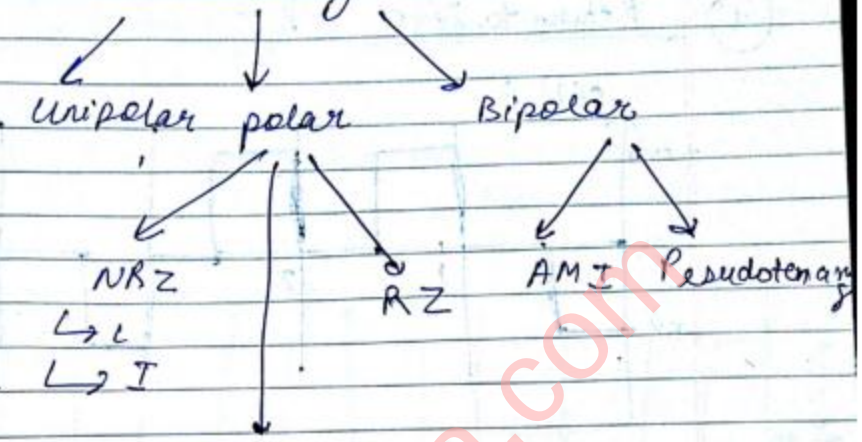

$$V_M = M V_C$$

$$V_M = V_{max} - V_{min}$$

$$V_C = \frac{V_{max} - V_{max} - V_{min}}{2}$$

$$\therefore V_C = \frac{2_{max} - V_{max} - V_{min}}{2}$$

# Data Encoding




(2) Polar → NRZ-L

0 → +ve term

1 → -ve term

0 → No change

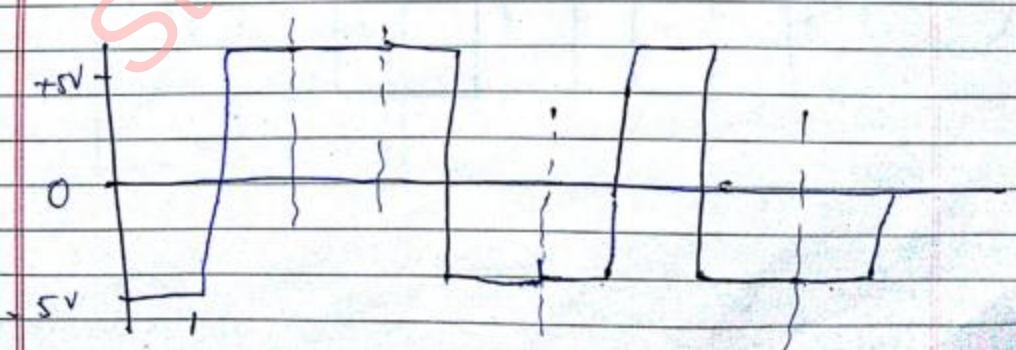
0 → +ve level

1 → change

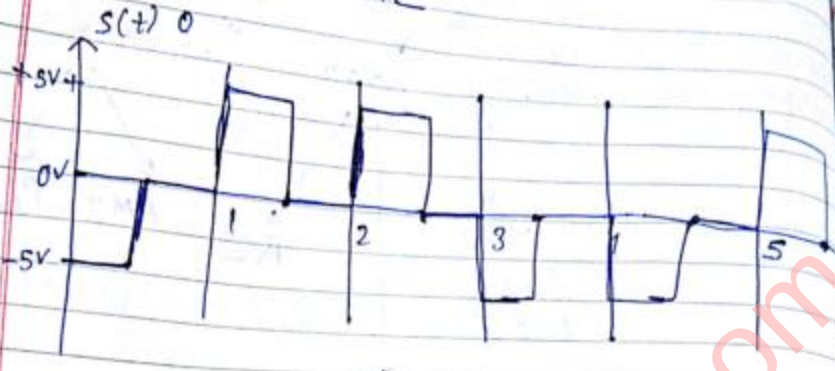
1 → -ve level

0 → -ve to zero

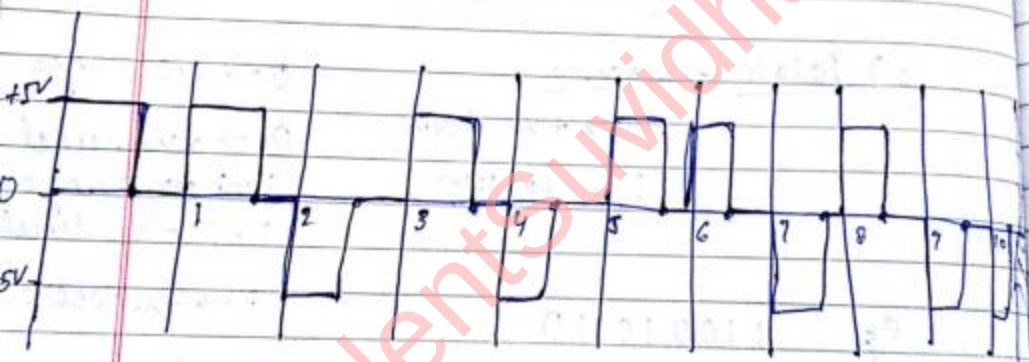
Eg 1100101101



(4) Return to Zero RZ




Eg 1 1 0 1 0 1 1 0 1 0 0



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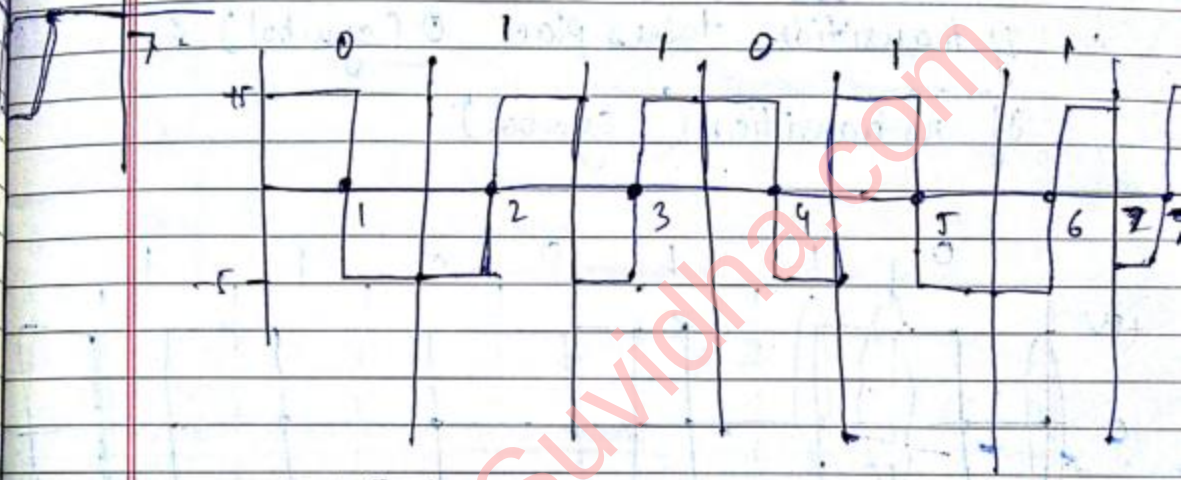
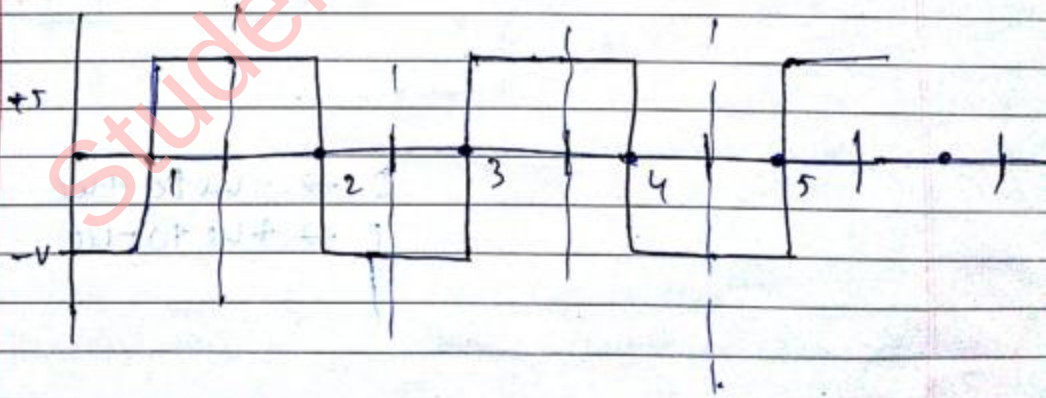
# Manchester Encoding

1's represented as −ve to +ve
0's " " +ve to −ve



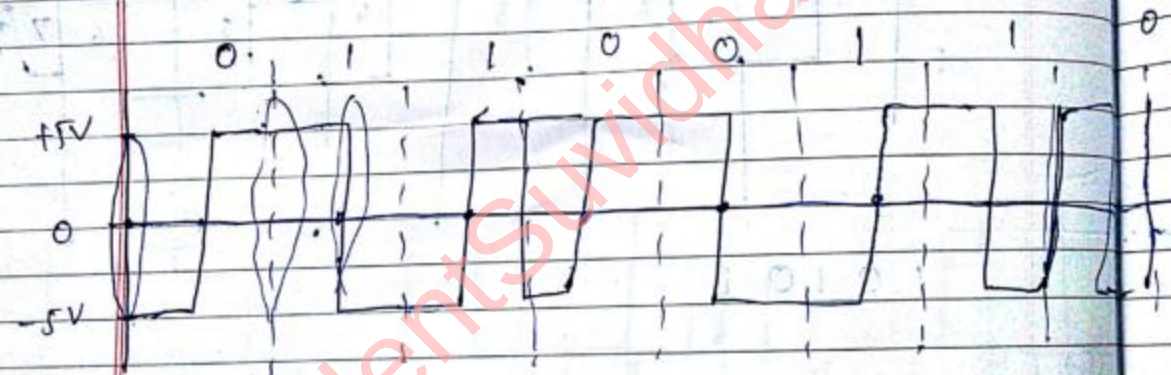

1 0 1 0 1



## Differential Machester

The symbol is represented as the edge of the transition

If transition takes place 0 (symbol) &
If no transition (1 symbol)



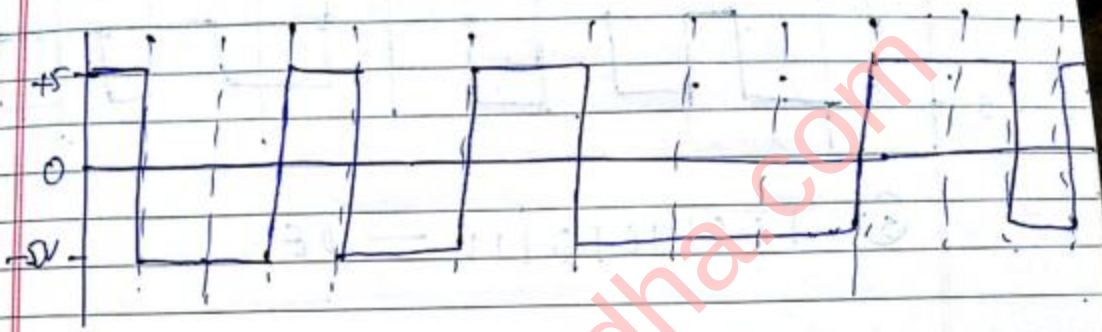

0 → -ve to +ve
1 → +ve to -ve

(1) 10011011001 NRZ-I

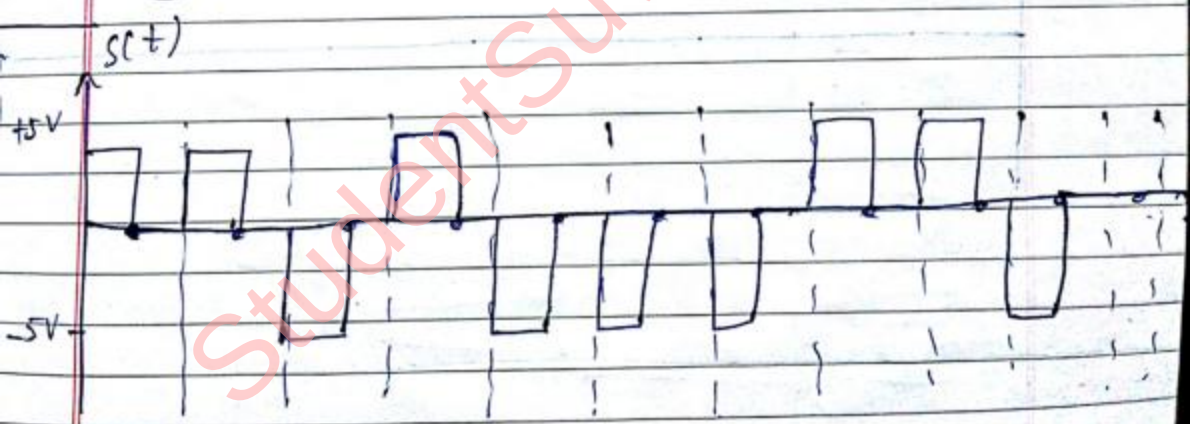
(2) 0110.10111010 NRZ-V

0 → +ve

1 → -ve



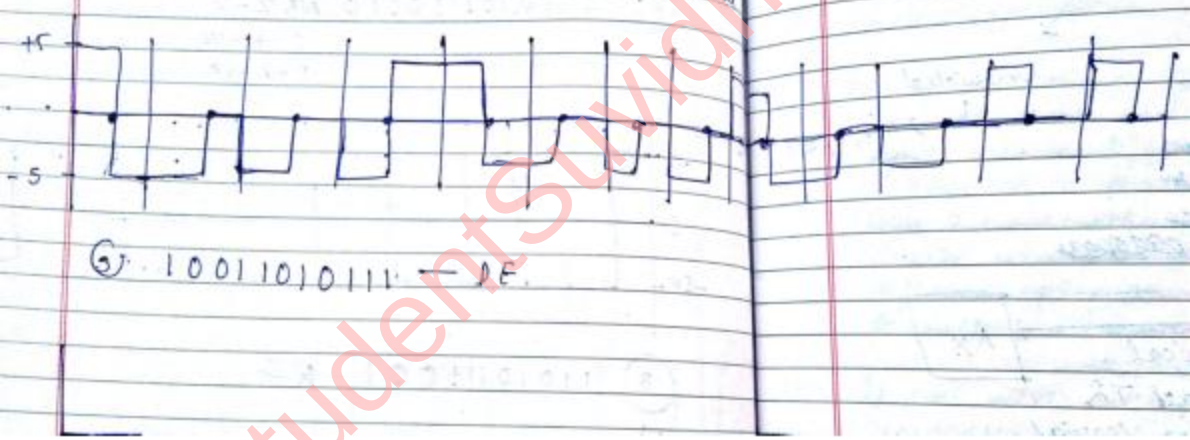

(3) 11010111001 RZ



(4) 0 0 0 1 0 0 0 1 0 0 1 1 - ME

1 - -ve to +ve

0 - +ve to -ve




(5) 1 0 0 1 1 0 1 0 1 1 1 - ME