Start from page 07 of last class.

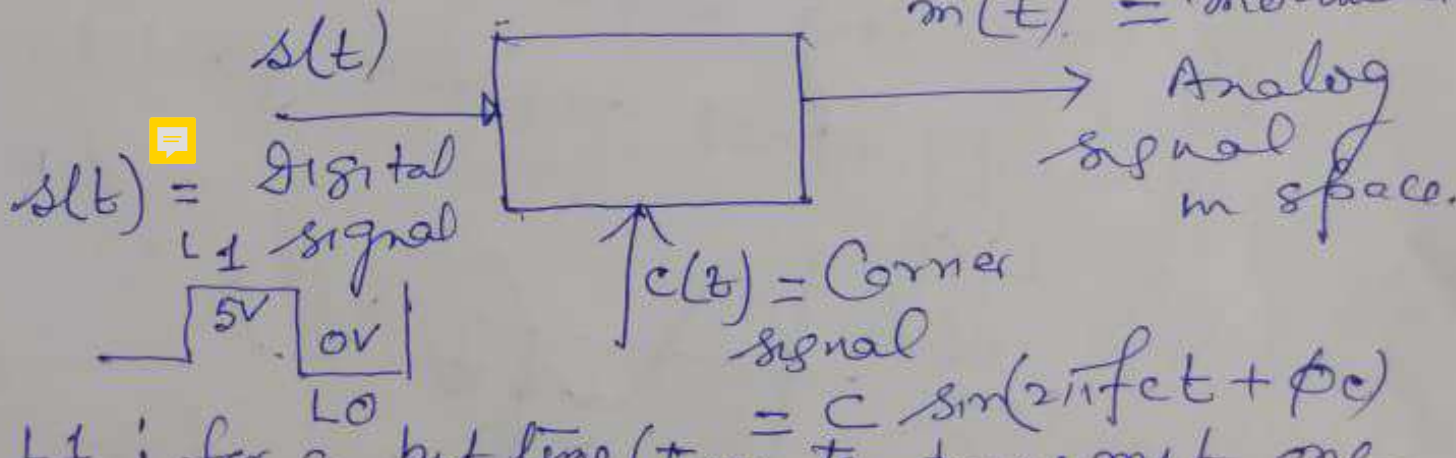
01. @ All Through Earlier discussion we find, multiple sources Digital transmission over space has to be FDM in space

(b) Transmission shall be Analog

(c) Communication shall be digital

(d) Modulation shall be from Digital signal to Analog

02. Digital modulation



$= C \sin(2\pi f_c t + \phi_c)$

L1 : for a bit time (Time to transmit one bit) $= \frac{1}{\text{Digital Data Rate}}$

For L0 $s(t) = 5V$ $s(t) =$

03. Types of Digital Modulation.

Analog Modulation

AM → ASK (Amplitude Shift keying)

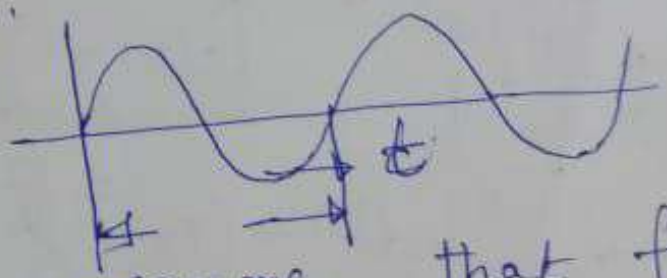
FM → FSK (Frequency shift keying)

× PM → PSK (Phase shift keying)

04. ~~Control~~ Key definations for Digital transmissions:-

(a) Digital bit Rate: Number of digital bits either Logical 1 or logical zero transmitted per second.

(b) Signalling element: What analog signal is sent for L1 or L0.

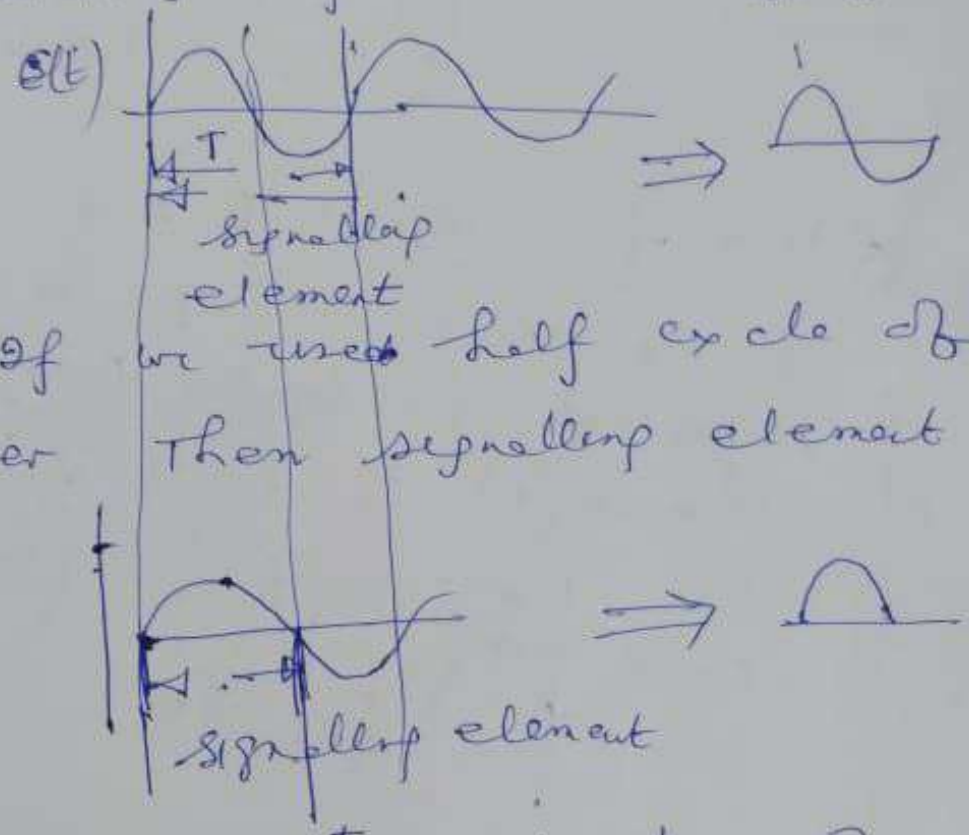


C(t)
Carrier

Let us assume that for

transmitting logical 1 a logical zero we shall use one cycle of carrier signal.

(i) So here signalling element ; Also known as baud.



(ii) If we used half cycle of carrier Then signalling element

(c) Signalling rate : Number of signals transmitted per second.

fc above (i) Signalling Rate = fc

(ii) Signalling Rate = 2fc

The signalling Rate is also known as baud rate.

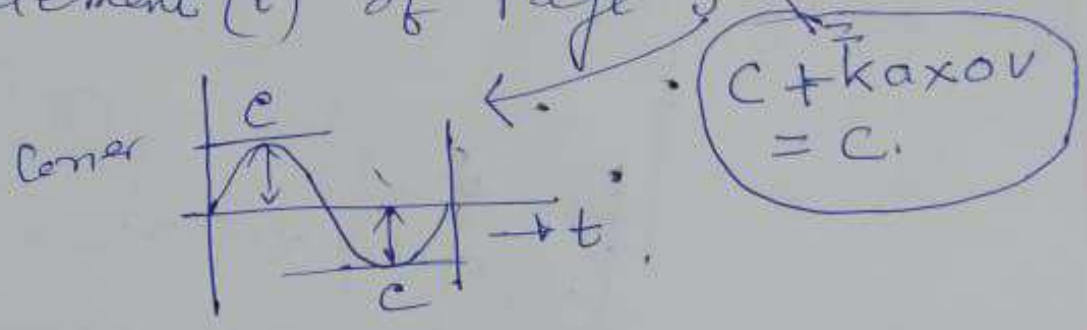
(1) ASK ⇒ Amplitude Shift keying.

$m_a(t) = (C + ka\{s(t)\}) \sin 2\pi fct$.

We change Amplitude of carrier keeping fc & φc constant.

(a) Now for logical 0 $s(t) = 0V$.

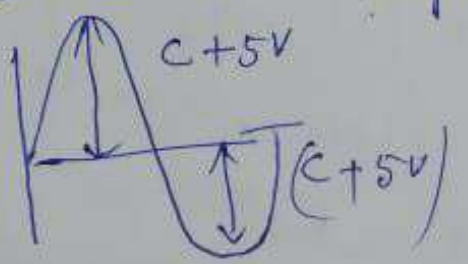
So As per our definition of ASK, Amplitude for logical 0 for signalling element (i) of Page 3



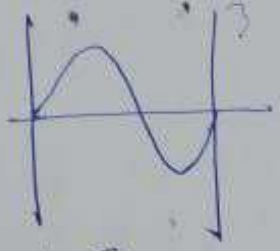
(b) So Signalling element for logical 1 : Amplitude = C + ka 5

= (C + 5) V

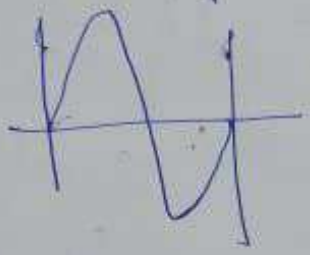
(ka = 1)



So we use two level of voltages for signaling element

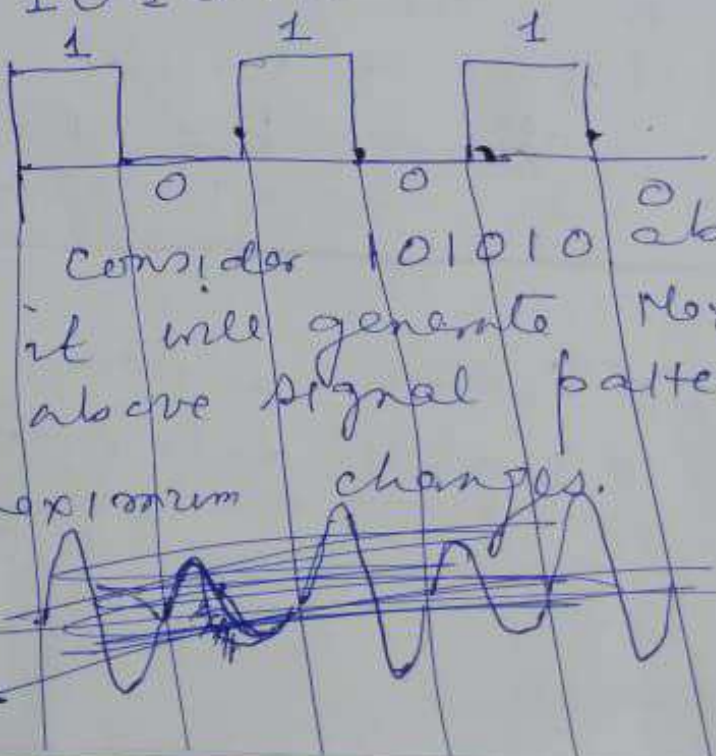


⇒ L0 ⇒ Same as corner Amplitude for one signaling element



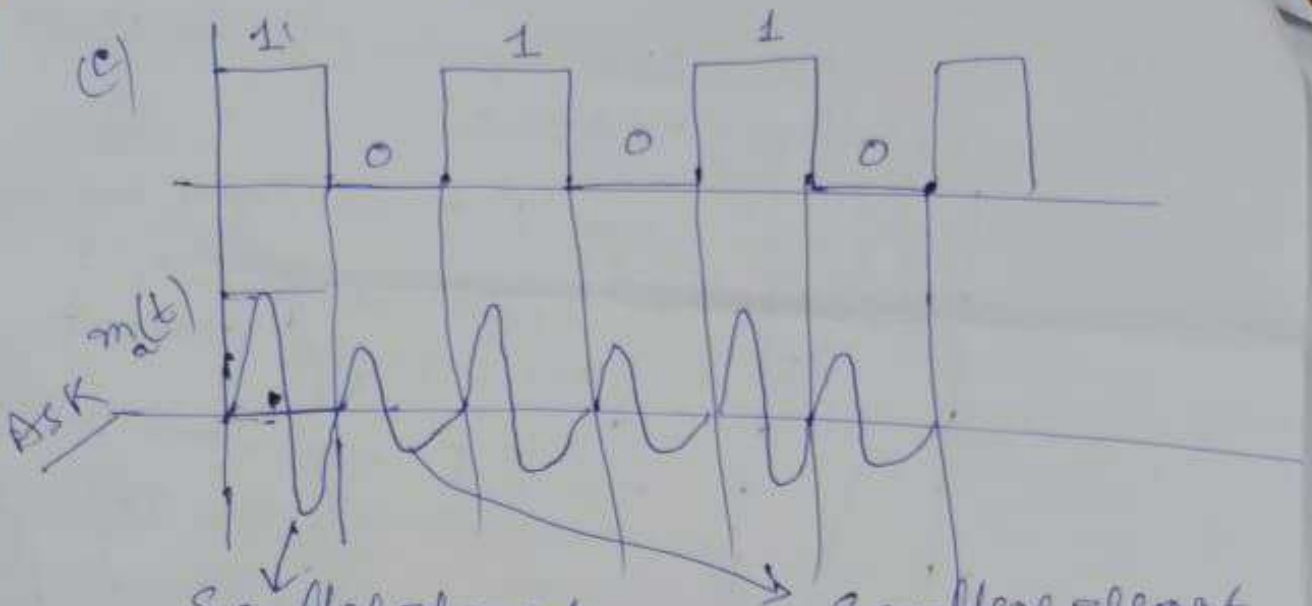
⇒ L1 ⇒ Some value higher than corner Amplitude for one signaling element.

(c) Let us transmit the Digital signal 1 0 1 0 1 0



Why we consider 101010 above Because it will generate Maximum Bit as above signal pattern has maximum changes.

(c)



Signalling element of logical 1 ⇒ Higher Amplitude of Carrier

Signalling element of logical 0 ⇒ Same as Carrier Amplitude

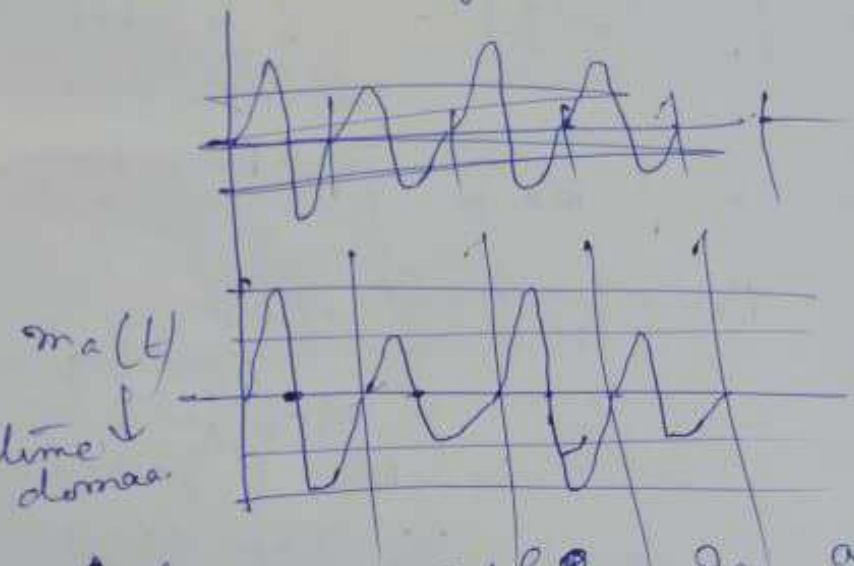
(d) ~~Digital~~ One digital bit is transmitted in one one signalling element or baud

⇒ ~~Above bit Rate~~

In above: Digital Bit Rate = Baud rate.

⇒ So in 2 level ASK Digital data rate (bit rate) = Baud rate.

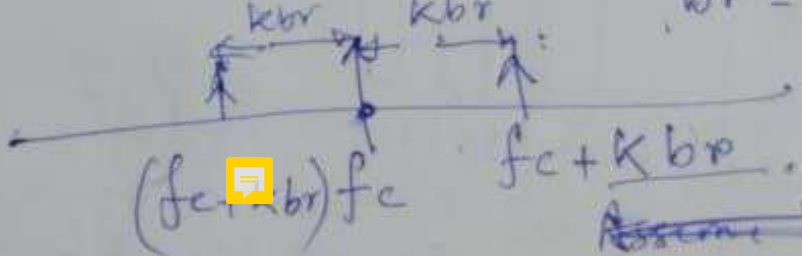
(e) Next from transmitted signal of (c) of Page 06.



In ASK Corner frequency fc remain same.

Ask your self? Is above signal original is same as corner signal with a single frequency fc? ⇒ No it is corner signal changing at Amplitude. rate. ⇒ more the baud rate ⇒ more the change ⇒ more will be higher frequency generated.

(f) ma(t) in Frequency domain.



~~Assume K = 1/2~~

(g) (i) For practical purpose we keep $k = \frac{1}{2}$ ~~(If we take $k = 1$~~ Then

So BW of $m_a(t) = (f_c + \frac{1}{2} b_r) - (f_c - \frac{1}{2} b_r)$

$= b_r$ = baud rate

(ii) If we keep ~~k~~ $k = 1$

Then BW of $m_a(t) = 2 b_r$

= (double)

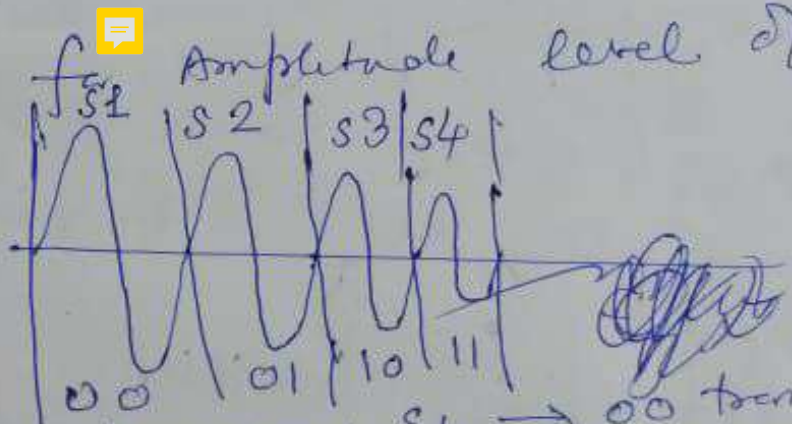
$\Rightarrow$ More will be BW Required

~~X~~ not done

(h) So far Two Amplitude level ASK (i) Bit rate = Baud Rate

(ii) BW of digital channel = Baud rate

(i) Multi level ASK: If we take Amplitude level of 4 ms.



Signally element S1 $\Rightarrow$ 00 transmit S2 $\Rightarrow$ 01

S3 $\Rightarrow$ 10 S4 $\Rightarrow$ 11 transmit