Lec, DC, 9/10/24, Sec-B

Intersymbol Interference :-
(ISI or ISI)

2. Sampling at a rate > Nyquist rate
of 2B samples/sec.

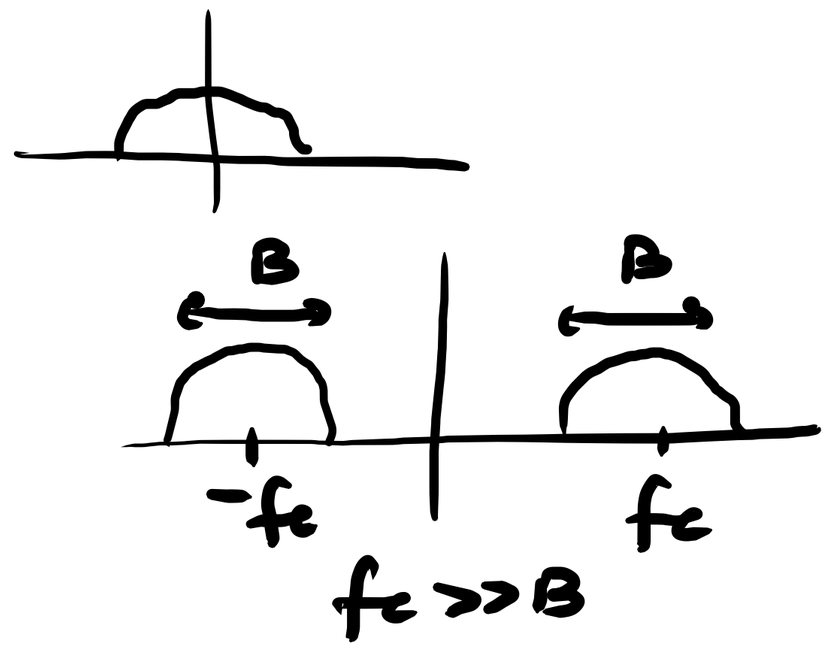
3. Quantization

4. Encoding — PCM signal

000 — 111 Samples → seq. of bits
L_1 — L_8 we need to calculate an

Revise

1. m(t), B.L.
to B Hz



important metric → T_b (bit interval) or $1/T_b = R_b$ bit rate

Q. How will the bit seq. be Txd. over the media? ← wireless, wire optical

Reqd. Bit sequence → waveform

$1 \longrightarrow p_1(t) \longrightarrow [0, T_b]$

$0 \longrightarrow p_2(t) \longrightarrow [0, T_b]$

$$x(t) = \sum_{k=-\infty}^{\infty} a_k p(t - kT_b)$$

all corresponds to the level of k^{th} bit

WF consists the seq. of bits.

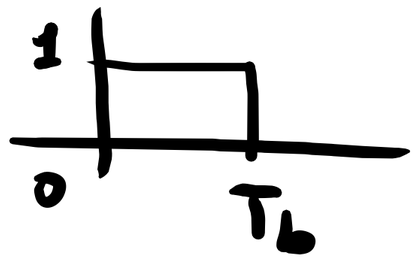
can we have levels for 0 & 1, keeping the W.F same. i.e.,

$p_1(t) = a_1 p(t)$ ✓

$p_2(t) = a_0 p(t)$

$p(t) \longrightarrow [0, T_b]$

$x(t)$ → linearly modulated signal

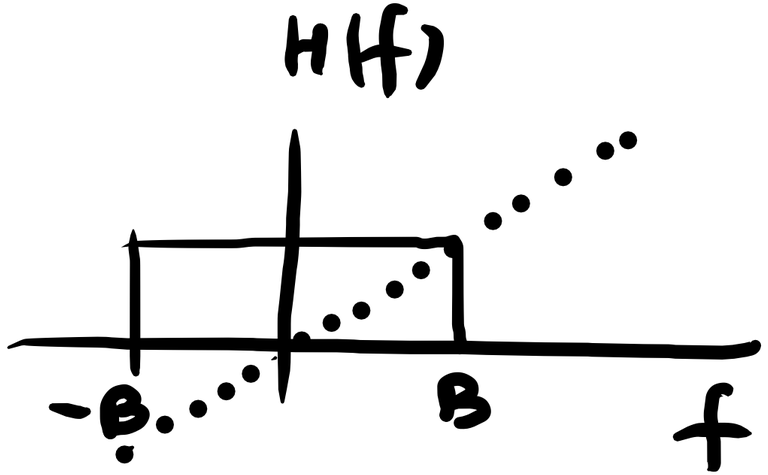
→ If we use $p(t)$ → 

, then what is $P(f)$?

↓

sinc(...)

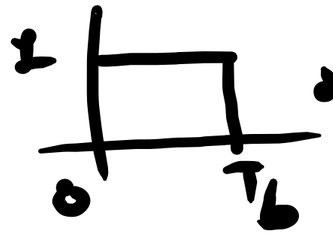
In order to Tx. it w/o distortion, we need a very large band. Let the channel is rep. as $h(t)$. To Tx. sinc spectrum w/o Dist., we need a flat resp. from a large − freq. to +ve freq.



→ Real-life channels won't satisfy the above cond.

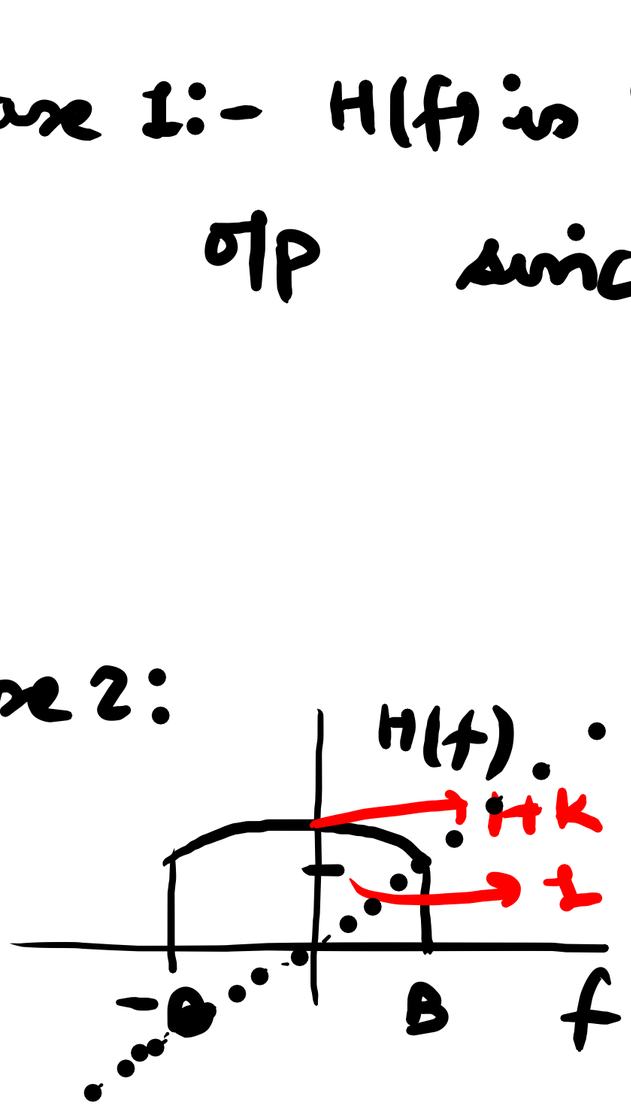
Case 1:- H(f) is DL & is B'L to BHz.

o/p $\quad \text{sinc}(\cdot\cdot) \times H(f) \xrightarrow{\text{Time domain}}$ PHY $\ast$ sinc(·)



" $\rightarrow$ o/p does not stay within $0, T_b$ leading to ISI.

Case 2:



Prob. A low pass filter T.F. H(f) is given by

$$H(f) = \begin{cases} (1 + k\cos 2\pi f T)\, e^{-j2\pi f t_d}, & |f| < B \\ 0, & |f| > B \end{cases}$$

A pulse g(t) B.L. to B Hz is applied at the i/p of this filter. Find the o/p y(t).

$$y(t) = g(t-t_d) + \frac{k}{2}\left[g(t-t_d-T) + g(t-t_d+T)\right]$$

So, how to counter the issues? → Nyquist criteria < 1, 2, 3

$$p(t) = \begin{cases} 1, & t = 0 \\ 0, & t = \pm nT_b \end{cases}$$