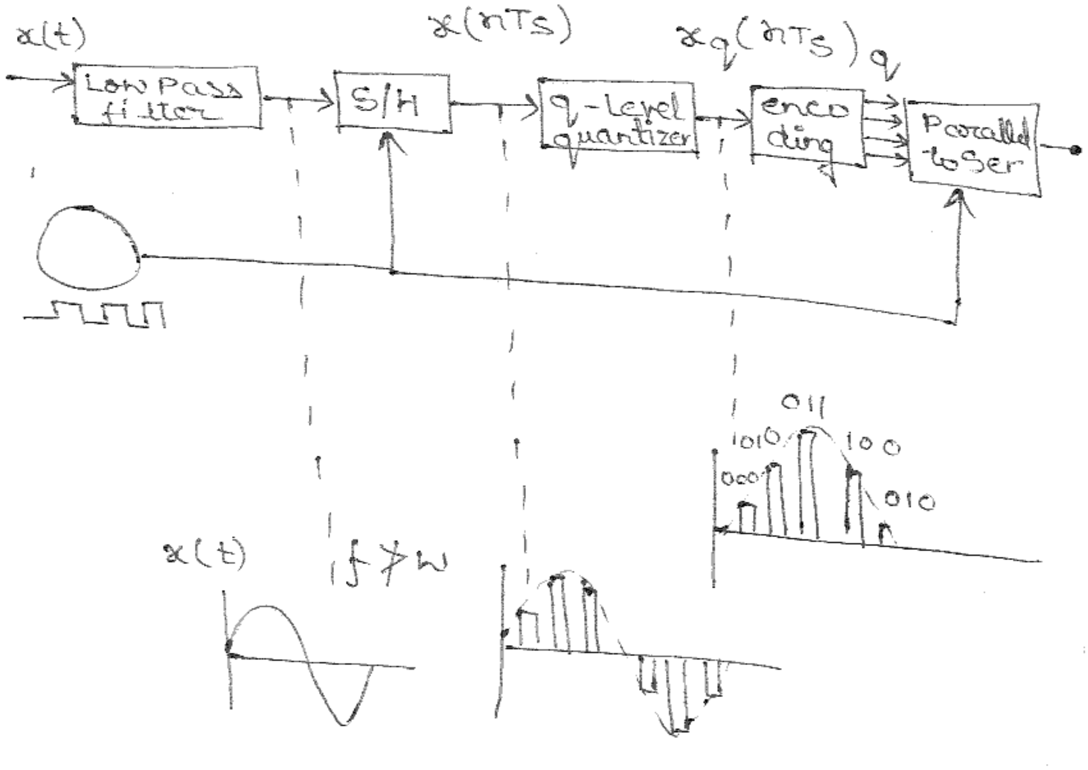
5.7.11

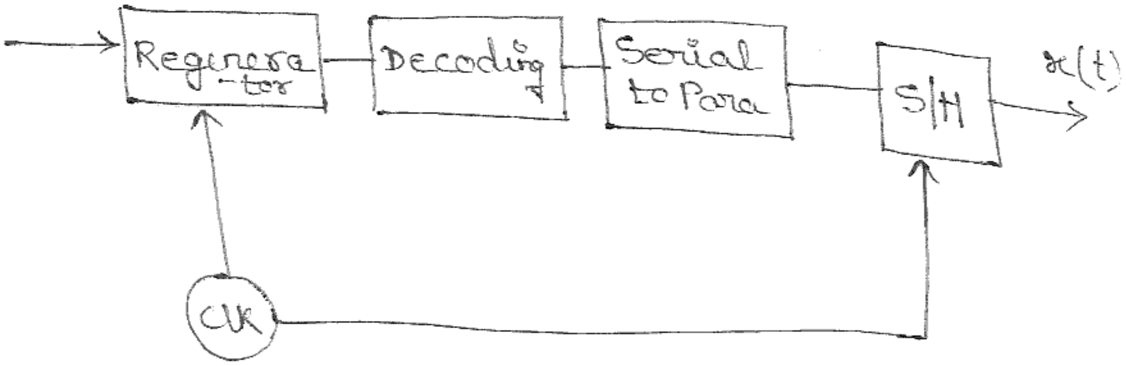
1.7.11

WKT

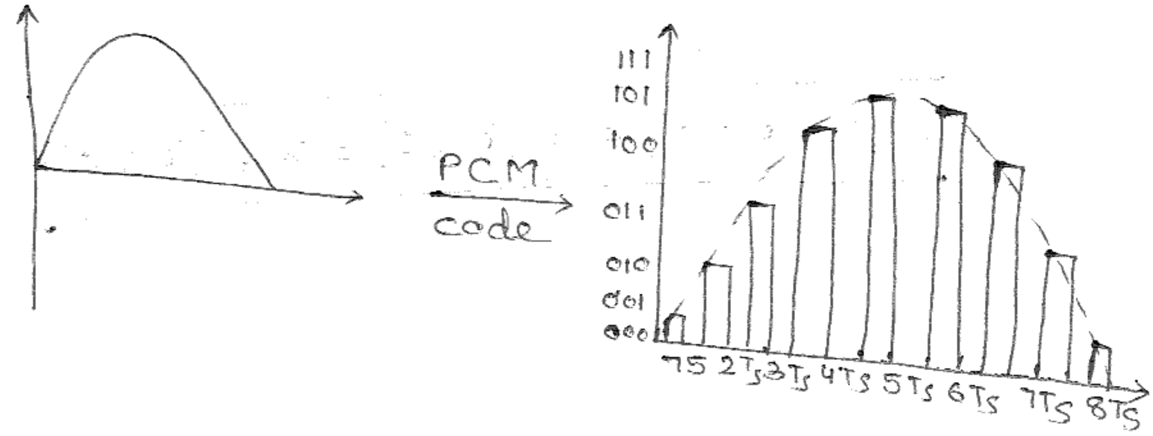
In PCM



PCM + Noise

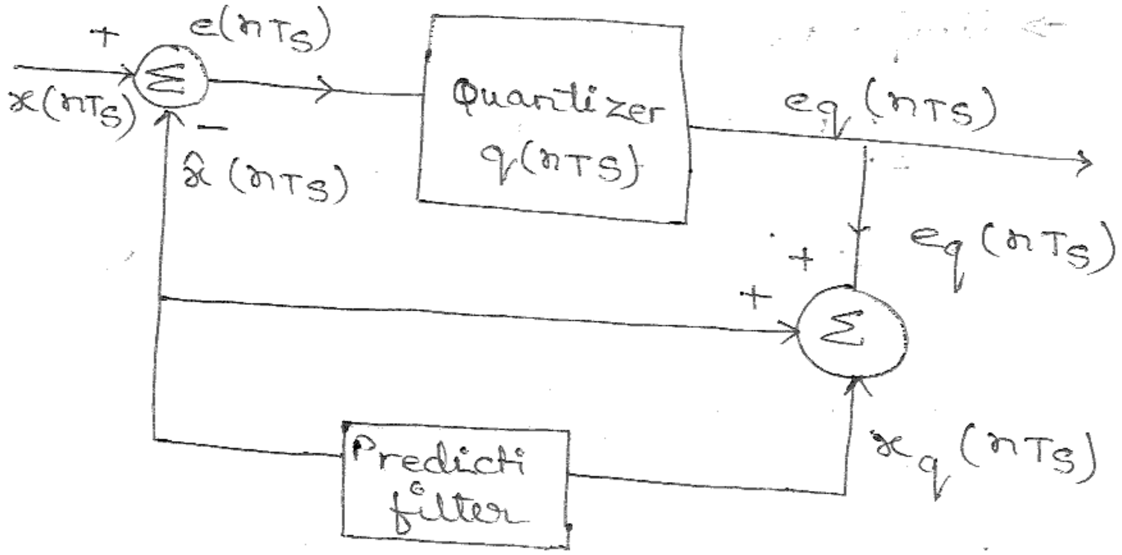


★ PCM



$$B = \frac{1}{2} \gamma$$

★ DPCM



$$x(nTS) - \hat{x}(nTS) = e(nTS) \quad \text{—— (I)}$$

$$\hat{x}(nTS) + e_q(nTS) = x_q(nTS) \quad \text{—— (II)}$$

$$e(nTS) + q(nTS) = e_q(nTS) \quad \text{—— (III)}$$

$$\therefore \hat{x}(nT_S) + e(nT_S) + q(nT_S) = x_q(nT_S)$$

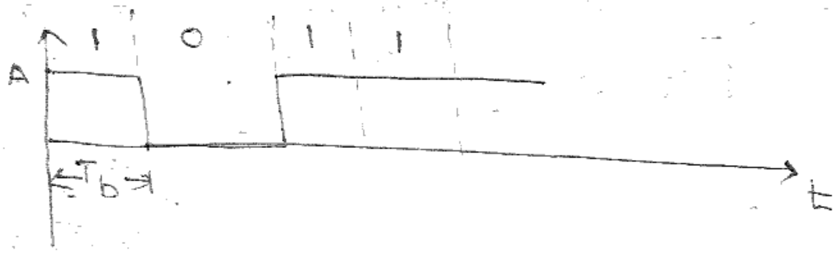
$$\hat{x}(nT_S) + x(nT_S) - \hat{x}(nT_S) + q(nT_S) = x_q(nT_S)$$

$$\boxed{\therefore x(nT_S) + q(nT_S) = x_q(nT_S)}$$

14.7.11

★ Baseband representation with various binary format

→ Unipolar NRZ



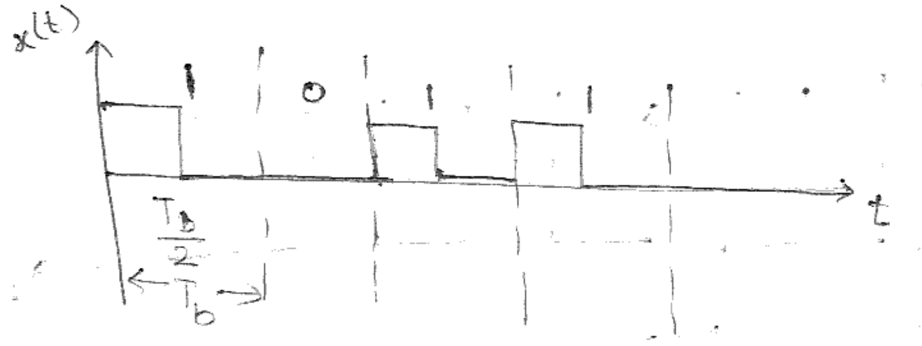
If '1' Transmitted :

$x(t) = A \quad$ for $0 \leq t \leq T_b$

If '0' Transmitted

$x(t) = 0 \qquad 0 \leq t \leq T_b$

unipolar RZ



If '1' transmitted,

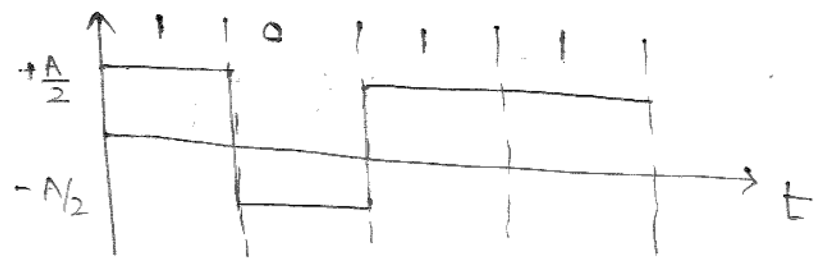
$x(t) = A$ for $0 \leq t \leq \frac{T_b}{2}$

$x(t) = 0$ for $\frac{T_b}{2} \leq t \leq T_b$

If '0' transmitted,

$x(t) = 0$ for $0 \leq t \leq T_b$

→ Polar NRZ



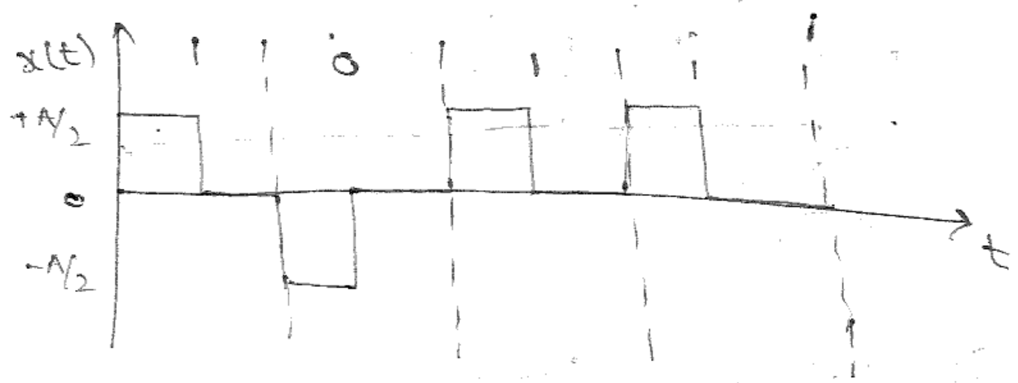
If '1' transmitted

$x(t) = +\frac{A}{2}$ for $0 \leq t \leq T_b$

If '0' transmitted

$x(t) = -\frac{A}{2}$ for $0 \leq t \leq T_b$

Polar RZ



If '1' transmitted

$x(t) = +\frac{A}{2}$ for $0 \leq t \leq \frac{T_b}{2}$

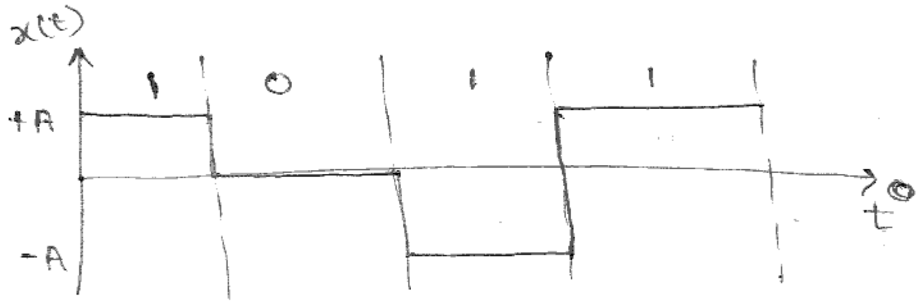
$x(t) = 0$ for $\frac{T_b}{2} \leq t \leq T_b$

If '0' transmitted

$x(t) = -\frac{A}{2}$ for $0 \leq t \leq \frac{T_b}{2}$

$x(t) = 0$ for $\frac{T_b}{2} \leq t \leq T_b$

→ Bipolar (Pseudo trinary / AMI or Alternate Mark Inversion)



If '0' transmitted

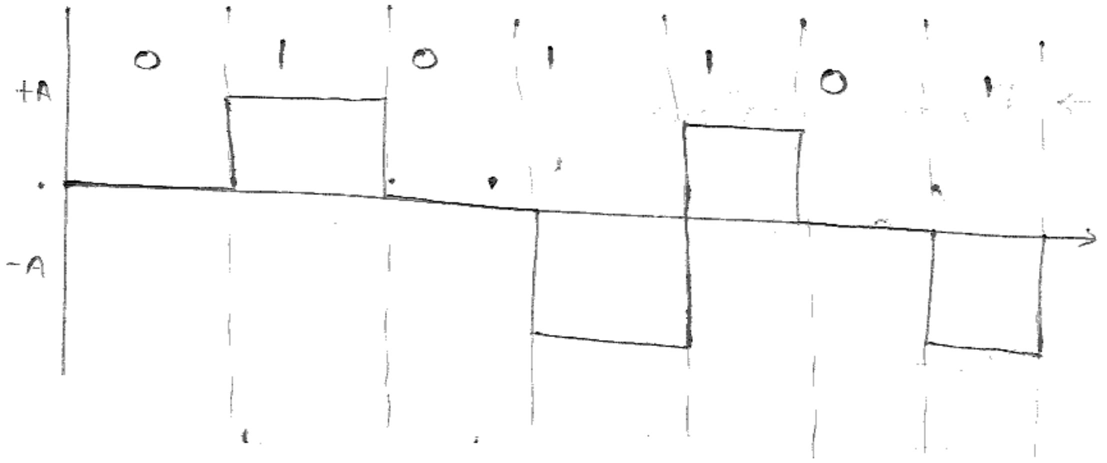
$x(t) = 0 \quad \text{for } 0 \leq t \leq T_b$

If 'odd no. of '1' transmitted

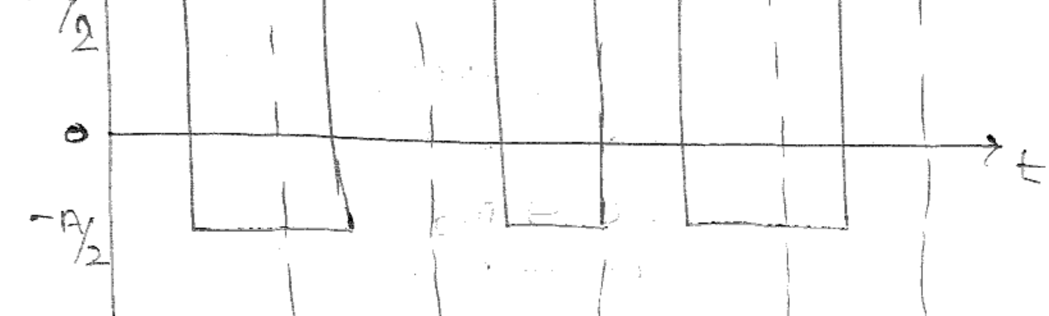
$x(t) = +A \quad \text{for } 0 \leq t \leq T_b$

If even no. of '1' transmitted

$x(t) = -A \quad \text{for } 0 \leq t \leq T_b$



ternate → Split phase Manchester



If '1' transmitted

$x(t) = +A/2$ for $0 \le t \le T_b/2$

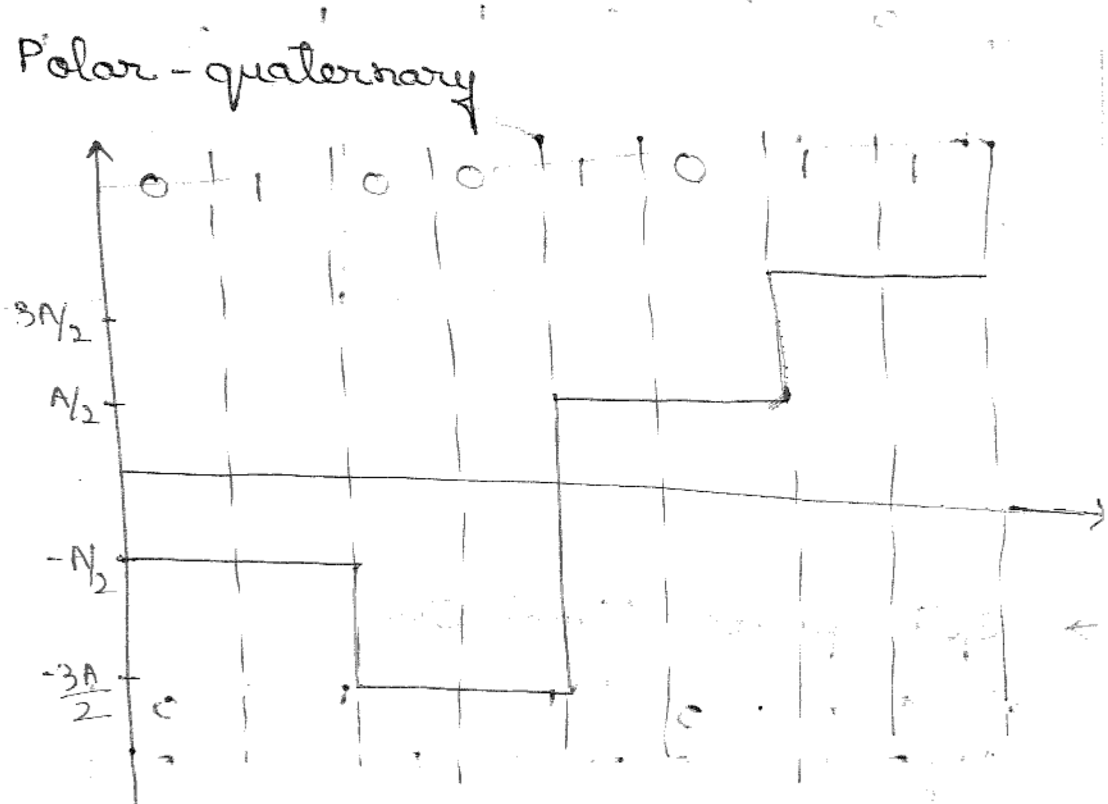
$x(t) = -A/2$ for $\frac{T_b}{2} \le t \le T_b$

If '0' transmitted

$x(t) = -A/2$ for $0 \le t \le T_b/2$

$x(t) = +A/2$ for $\frac{T_b}{2} \le t \le T_b$

→ Polar - quaternary



00 → $-3A/2$

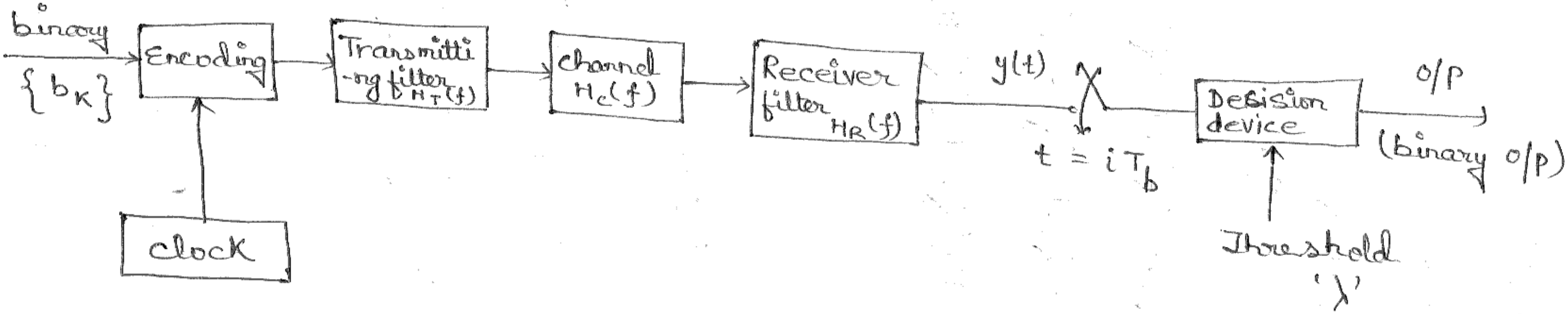
01 → $-A/2$

10 → $A/2$

11 → $3A/2$

Block in baseband transmission

Block in baseband transmission



$\lambda < y(t_i)$, bit 1

$\lambda > y(t_i)$, bit 0

$$x(t) = \sum_{K=-\infty}^{\infty} A_K g(t - KT_b)$$

$$y(t) = \mu \sum_{K=-\infty}^{\infty} A_K P(t - KT_b)$$

$P(t - KT_b) \rightarrow$ shape change signal $\mu \rightarrow$ scaling factor

$y(t) = x(t)h(t)$

In frequency domain

$Y(f) = \lambda(f).H(f)$

$\mu A_K P(f) = A_K G(f) H(f)$

$H(f) = H(f).H_c(f).H_R(f)$

$\mu A_K P(f) = A_K G(f).H_T(f).H_c(f).H_R(f)$

$\mu P(f) = G(f).H_T(f).H_c(f) H_R(f)$

when

$t = iT_b$

$$y(t_i) = \mu \sum_{K=-\infty}^{\infty} A_K P(iT_b - KT_b)$$

$$y(t_i) = \mu \sum_{K=-\infty}^{\infty} A_K P[T_b[i-K)]$$

$i = K \rightarrow$ If order of transmission equal to order of reception

when

$K = i$

$$y(t_i) = \mu A_i P[0]$$

$K \neq i$

$$y(t_i) = \mu \sum_{K=-\infty}^{\infty} A_K P[T_b[i-K)]$$

$\therefore$ $P(0) \rightarrow$ Normalized signal

$\therefore$ $P(0) = 1$

$$y(t_i) = \underbrace{\mu A_i}_{\text{free from ISI}} + \mu \underbrace{\sum_{K=-\infty}^{\infty} A_K \, P[T_b(i-K)]}_{\text{ISI noise}}$$

where

ISI = Inter Symbol Interference

Interference b/w the order of transmission and order of reception