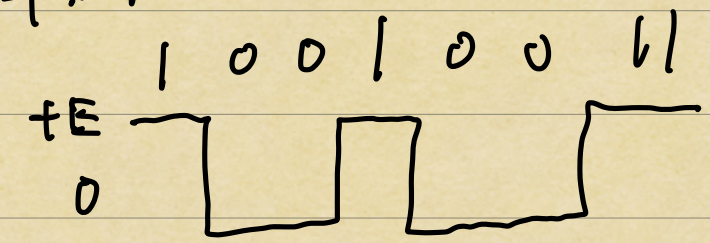
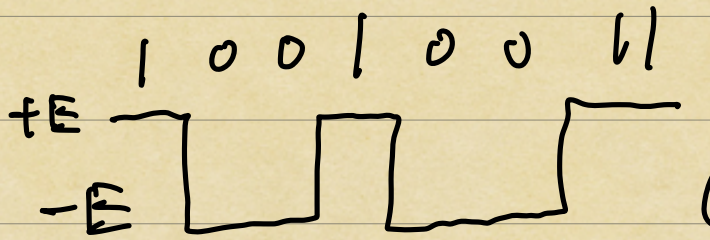
6) 单极性

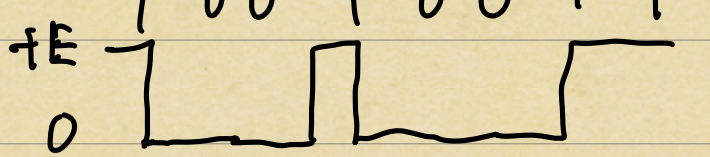


双极性



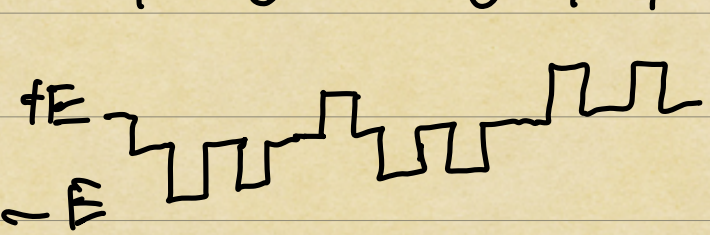
C E A B D

单极性归零

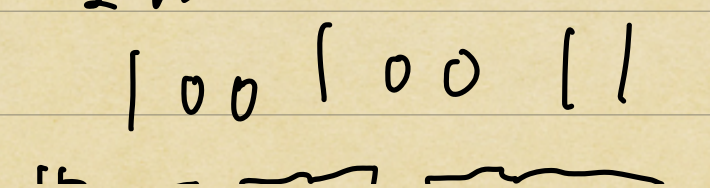


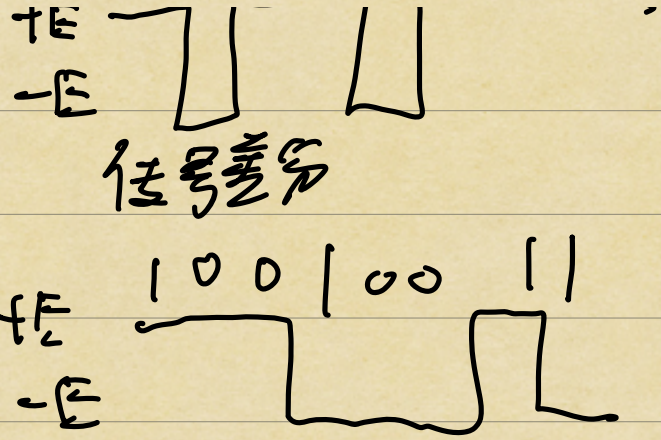
B C E D A

双极性归零



空号差分





6-2

1 1 0 0 0 0 0 1 1 1 0 0 0 0

1开状正，0开状负

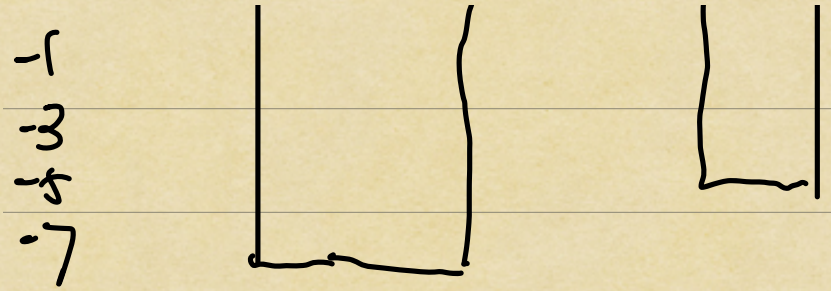
00 -1

01-3

10-5

11-7

八电平



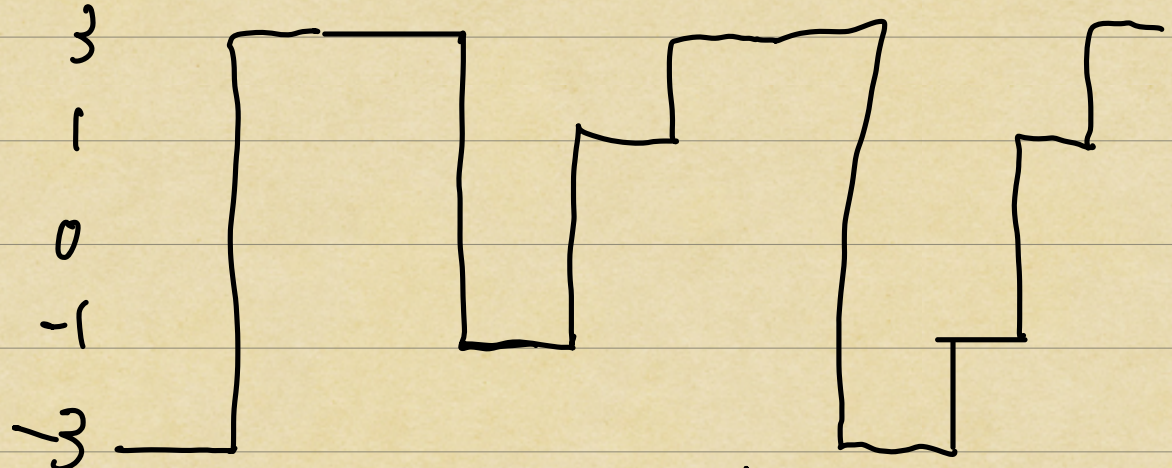
四电平

00 -1

01 -3

10 -1

11 -3



P_B相同

$P_b = P_B \log_2 M$

M进制 P_b更高

6-7

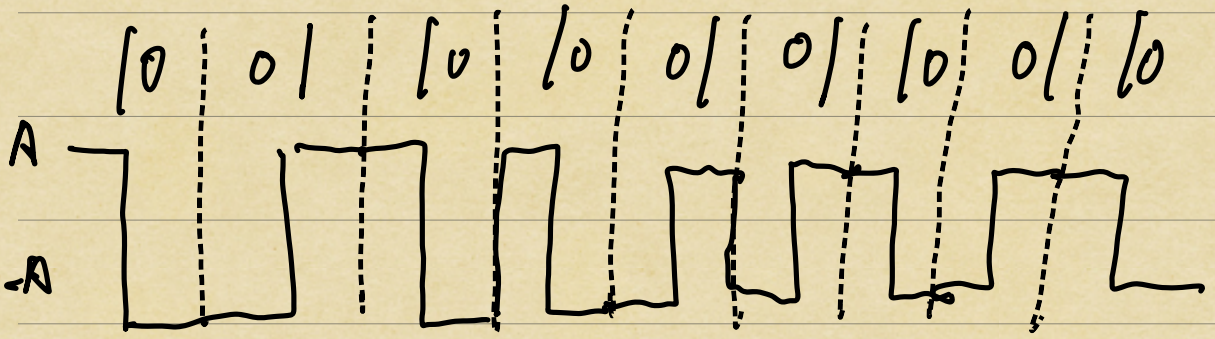
1 0 1 1 0 0 0 0 0 0 0 0 0 1 0 1

AMI +1 0 -1 +1 0 0 0 0 0 0 0 0 0 -1 0 +1

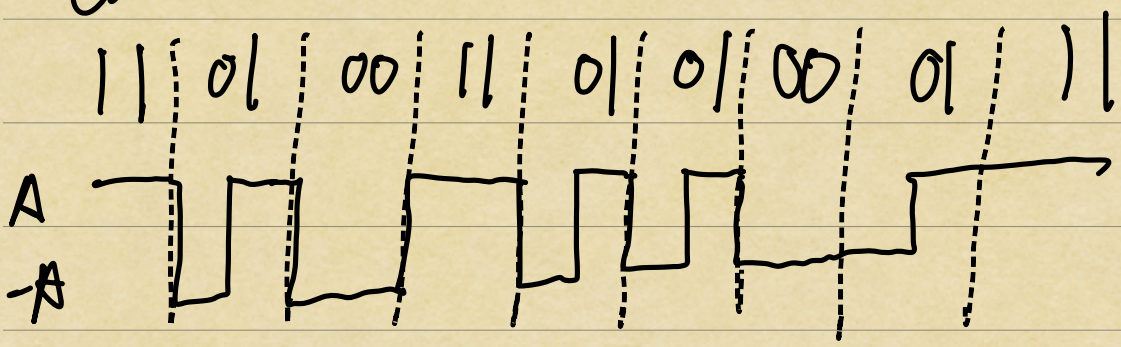
HDB3 +1 0 -1 +1 0 0 0 V+ B- 0 0 V- 0 +1 0 -1

6-8

双相码:



CMI码:



6-4

(1) $g(t)=\begin{cases}1-\frac{2}{T_B}|t| & |t|\le\frac{T_B}{2}\\ 0 & \text{其他}\end{cases}$

$h(t)=g(t-\frac{T_B}{2})$

$g(t)\xrightarrow{FT}G(\omega)=\frac{T_B}{2}Sa^2\left(\frac{\omega T_B}{4}\right)$

$H(\omega)=G(\omega)e^{-j\frac{\omega T_B}{2}}=\frac{T_B}{2}Sa^2\left(\frac{\omega T_B}{4}\right)e^{-j\frac{\omega T_B}{2}}$

(2) $H(\omega)=G_T(\omega)C(\omega)G_R(\omega)$

$C(\omega)=1$, $G_T(\omega)=G_R(\omega)$

$G_T(\omega)=G_R(\omega)=\sqrt{H(\omega)}=\sqrt{\frac{T_B}{2}}Sa\left(\frac{\omega T_B}{4}\right)e^{-j\frac{\omega T_B}{4}}$

6-11

无ISI最高 $P_{Bmax}=2f_N$

实际 $P_B=\frac{2}{T_B}$ $P_{Bmax}=nP_B$ $n=1,2,3\cdots$ 也可以

(a) $P_{Bmax}=\frac{1}{T_B}<P_B$ 不符合

(b) $R_{B\max}=\frac{2}{T_0}$，$>R_B$，非整数，不能

(c) $R_{B\max}=\frac{2}{T_0}=R_B$ 可以

(d) $R_{B\max}=\frac{1}{T_0}<R_B$ 不能

6-13

(1) $R_{B\max}=2\times\frac{\omega_0}{2\pi}=\frac{\omega_0}{\pi}$

该系统可等效成理想矩形低通

$$H_{eq}(\omega)=\begin{cases}1 & |\omega|\le\omega_0\\ 0 & |\omega|>\omega_0\end{cases}$$

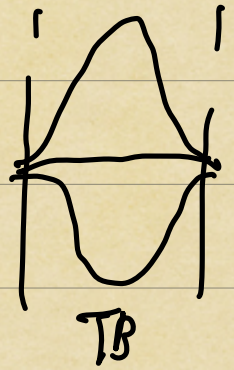
(2)

$$B=\frac{(1+\alpha)\omega_0}{2\pi}$$

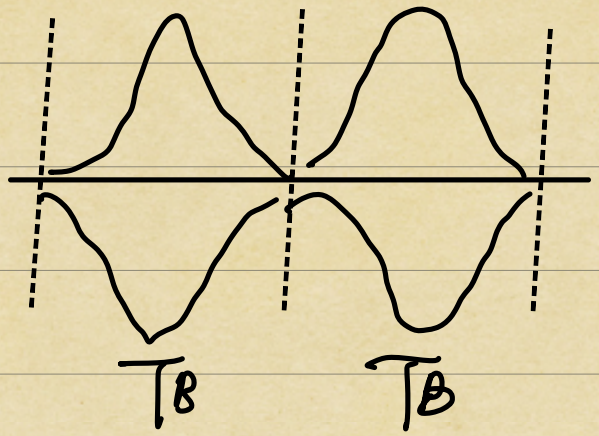
$$\eta=\frac{R_B}{B}=\frac{2}{1+\alpha}$$

6-14

(1) $T_0 = T_B$时



(2) $T_0 = 2T_B$时



(3) $T_0 = T_B$时

最佳抽样判决时刻 $\frac{T_0}{2}$

判决门限0

噪声容限值1

$T_0 = 2T_B$时

最佳抽样判决时刻 $\frac{T_0}{4}$ $\frac{3T_0}{4}$

判决门限0

噪声容限值

$$D_X = \frac{1}{X_0} \sum_{k=-\infty, k\neq 0}^{\infty} |X_k|$$

6-23

$$D_X = \frac{1}{X_0} \sum_{\substack{k=-2 \\ k\neq 0}}^{2} |X_k| = \frac{1}{8} + \frac{1}{3} + \frac{1}{4} + \frac{1}{6} = \frac{37}{48}$$

$$y_k = \sum_{i=-\infty}^{\infty} C_i X_{k-i}$$

三抽头

C_{-1} C_0 C_1

$$y_{-4} = \sum_{i=-1}^{1} C_i X_{-4-i}$$

$$= \underbrace{C_{-1}X_{-3} + C_0 X_{-4} + C_1 X_{-5}}_{0}$$

$$= 0$$

$$y_{-5} = \sum_{i=-1}^{1} C_i X_{-5-i}$$

$$= C_{-1}X_{-2} + \underbrace{C_0 X_{-3} + C_1 X_{-4}}_{0}$$

$$= -\frac{1}{24}$$

$$y_{-2} = \sum_{i=-1}^{1} C_i X_{-2-i}$$

$$= C_{-1} X_{-1} + C_0 X_{-2} + C_1 X_{-3}$$

$$= -\frac{1}{72}$$

$$y_{-1} = \sum_{i=-1}^{1} C_i X_{-1-i}$$

$$= C_{-1} X_0 + C_0 X_{-1} + C_1 X_{-2}$$

$$= -\frac{1}{32}$$

$$y_0 = C_{-1} X_1 + C_0 X_0 + C_1 X_{-1}$$

$$= \frac{5}{6}$$

$$y_1 = C_{-1} X_2 + C_0 X_1 + C_1 X_0$$

$$= -\frac{1}{48}$$

$$y_2 = C_{-1} X_3 + C_0 X_2 + C_1 X_1$$

$$= 0$$

$$y_3 = C_{-1}X_4 + C_0X_3 + C_1X_2$$

$$= -\frac{1}{64}$$

$$Dy = \frac{1}{y_0}\sum_{\substack{k=-\infty \\ k\neq 0}}^{\infty} |y_0|$$

$$= \frac{1}{y_0}\left| y_3 + y_2 + y_1 + y_{-1} + y_{-2} + y_{-3} \right|$$

$$= \frac{71}{480}$$

6-24

(1)

$$\begin{pmatrix} X_0 & X_{-1} & X_{-2} \\ X_1 & X_0 & X_{-1} \\ X_2 & X_1 & X_0 \end{pmatrix}\begin{pmatrix} C_{-1} \\ C_0 \\ C_1 \end{pmatrix} = \begin{pmatrix} 0 \\ \delta \end{pmatrix}$$

$$\begin{cases} C_{-1} + 0.2C_0 = 0 \\ -0.3C_{-1} + C_0 + 0.2C_1 = 1 \end{cases}$$

$|0.1C_1-0.3C_0+C_1=0$

解得 $C_{-1}=-0.1779$ $C_0=0.8897$, $C_1=0.2847$

(2)

$$Dx=\frac{1}{x_0}\sum_{\substack{k=-\infty\\ k\neq 0}}^{\infty}|x_k|=\frac{1}{x_0}\left|x_{-2}+x_{-1}+x_1+x_2\right|$$

$=0.6$

由 $y_k=\sum_{i=-N}^{N}C_i x_{k-i}$

$y_{-1}=0$, $y_0=1$, $y_1=0$

$y_{-3}=0$, $y_{-2}=-0.0356$ $y_2=0.00356$

$y_3=0.0285$

$$Dy=\frac{1}{y_0}\sum_{\substack{k=-\infty\\ k\neq 0}}^{\infty}|y_k|=0.0766$$

均衡后峰值失真减小8.87倍