EE206 2020 Spring

通信原理习题课

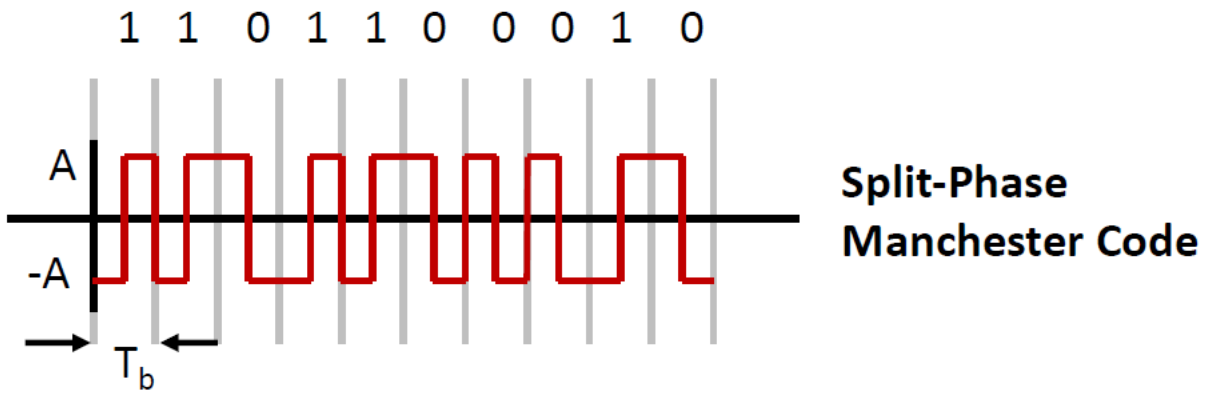
Digital Assignment 4

2020/5/26

Homework #D6

- D6.1

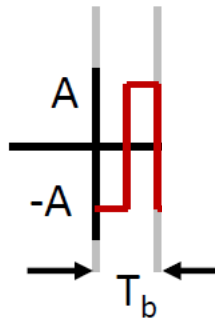
Please design the receiving filter c(t) for the following *Split-Phase Manchester Code* by both ideal Nyquist channel and raised cosine spectrum.



Solution

$$\mu p(t) = g(t) * h(t) * c(t)$$

$g(t)$:



$$G(f) = \int_0^{T_b/2} -Ae^{-i2\pi ft}dt + \int_{T_b/2}^{T_b} Ae^{-i2\pi ft}dt$$
$$= \frac{iA}{2\pi f}(2e^{i\pi Tbf} - e^{i2\pi Tbf} - 1)$$

$$h(t) \overset{FT}{\leftrightarrow} H(f)$$

For ideal Nyquist channel,

$$p(t) = sinc\left(\frac{t}{T_b}\right)$$

$$P(f) = T_b rect(tTb)$$

For Raised Cosine Spectrum,

$$P(f) = \begin{cases} T_b, & 0 \le |f| < f_1 \\ \frac{T_b}{2}\left\{1 - \sin\left[\frac{\pi(|f|-W)}{2W-2f_1}\right]\right\}, & f_1 \le |f| < \frac{1}{T_b} - f_1 \\ 0, & |f| \ge \frac{1}{T_b} - f_1 \end{cases}$$

$$p(t) = sinc(\frac{t}{T_b})\left(\frac{\cos(2\pi\alpha Wt)}{1 - 16\alpha^2 w^2 t^2}\right) \quad \text{Where } W = \frac{1}{2T_b}$$

Rolloff factor $\alpha = 1 - 2T_b f_1$

$$C(f) = \frac{\mu P(f)}{G(f)H(f)}$$