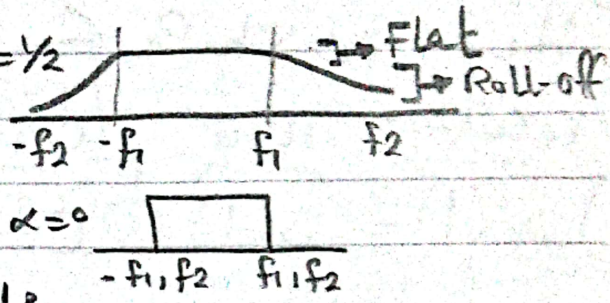
8] Raised Cosine Spectrum ⇒ $\alpha = 1/2$



Roll-off factor

$f_1 = (1-\alpha)w$

$f_2 = (1+\alpha)w$ ← BW

$0 < \alpha \leq 1$

$\alpha \uparrow$, BW ↑, Noise Immunity ↑, variation tail ↓↓

9] We want to solve 2 Problems → ISI & Noise

ReCall ⇒ $P(t) = \overbrace{g(t)}^{MSG} \circledast c(t) \circledast h(t)$

$\Rightarrow P(f) = G(f) * C(f) * H(f)$ } Assume Flat Channel ⇒ $C(f) = \text{const}$

So $G(f)\,H(f) = P(f)$

$\rightarrow G(f) = H(f) = \sqrt{P(f)}$ } ⇒ 2 root Raised Cosine Spectrum

10]

$R_s = \frac{R_b}{\log_2 M}$

$BW = (1+\alpha)w = (1+\alpha)\frac{R_s}{2}$

$T_s = \log_2 M \, T_b$

M-ary Transmission

$w = \frac{R_s}{2}$ (Low pass)

$BW = (1+\alpha)w$ OR $w \leq BW \leq 2w$ OR

$R_s = \frac{R_b}{\text{bits/symbol}}$

Sheet5 ISI

Q:1 $R_b = 56$ KbPS, PAM with Raised Cosine

Get BW for $\alpha = 0.25, 0.5, 0.75, 1$

$BW = (1+\alpha)\frac{R_b}{2}$

$BW = 28(1+\alpha)$

56 ← 1

0.25 → 35 KHz

0.5 → 42 KHz

0.75 → 49 KHz

Q:2 $BW)_{max} = 75$ KHz, $T_b = 10 * 10^{-6}$ s

$BW \geq (1+\alpha)\frac{R_b}{2}$

$\geq (1+\alpha)\frac{1}{2T_b}$

$(1+\alpha) \leq 1.5 \rightarrow \alpha \leq 0.5$

∴ We will use a Raised-Cosine Spectrum with Roll-off factor $0 \leq \alpha \leq 0.5$

Q:3 $f_1 = 0.8 * 10^6 \rightarrow f_1 = (1-\alpha)\omega$

$f_2 = 1.2 * 10^6 \rightarrow f_2 = (1+\alpha)\omega$

$f_1 + f_2 = 2\omega = 2 * 10^6$ [$\omega = 1 * 10^6$]

$f_2 = (1+\alpha)\omega$

$\alpha = f_2/\omega - 1 = 0.2$

ضربالك ٦ لازم تشتغل ع $\alpha = 0.2$

$\omega = \frac{R_b}{2} \Rightarrow R_b)_{max} = 2\omega)_{max} = 2 * 1 * 10^6 = 2$ MHz

Q:4 $R_b = 10^6$, $BW)_{channel} = 700 * 10^3$ Hz

$BW)_{chanel} \geq (1+\alpha) R_b/2 \Rightarrow [\alpha \leq 0.4]$

$0.5 \text{ MHz} \leq f_2 \leq 0.7$ MHz, $0.3 \text{ MHz} \leq f_1 \leq 0.5$ MHz