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ĐỀ THI CUỐI KỲ 2021.2.

Bài 1: abcd = 1234

$T_S = \frac{(c+1)}{250} = \frac{(3+1)}{250} = 0,016\ (ms)$

$\left|\frac{v_{max}}{v}\right| = 1,6 + \frac{d}{20} = 1,6 + \frac{9}{20} = 1,8$

$\frac{N_0}{2} = (75 + a + b) = 78\ \mu W/Hz$

a) $SNqR = \frac{3\cdot(2^n)^2}{\alpha} = \frac{3\cdot(2^n)^2}{\left(\frac{v_{max}}{v}\right)^2} = \frac{3\cdot(2^n)^2}{(1,8)^2}$

$SNqR\ (dB) \geq 43,2\ dB = 10^{\frac{43,2}{10}}\ (lần)$

$\Leftrightarrow \frac{3\cdot(2^n)^2}{(1,8)^2} \geq 10^{\frac{43,2}{10}}$

$\Leftrightarrow (2^n)^2 \geq \frac{10^{\frac{43,2}{10}}\cdot(1,8)^2}{3}$

$\Leftrightarrow n \geq \log_2 \sqrt{\frac{10^{\frac{43,2}{10}}\cdot(1,8)^2}{3}} =$

$\Leftrightarrow n \geq 7,23$

$R_{b\text{-}in}$ nhỏ nhất

$\Rightarrow R_{bin} = n\cdot f_s = 8\cdot\frac{1}{T_S} = 8\cdot\frac{1}{0,016\cdot10^{-3}} = 500\ (kb/s)$

b) $R_{bout} = 8R_{bin} + R_{b\text{-}them} = 8\cdot500\cdot10^3 + 8 = 4000008\ (b/s)$

$\Sigma bit\ khung = m\times n = 8\times8 = 64\ bit$

$T_F = \frac{\Sigma bit\ khung}{v_{ra}} = \frac{64}{4000008} = 16(\mu s)$

c) Kỹ thuật điều chế số là ASK

$P_{be} = \frac{1}{2}\left[1 - erf\left[\frac{1}{2}\left(\frac{S}{N}\right)^{\frac{1}{2}}\right]\right]$

$S = \frac{1}{2}(E_1 + E_0) = \frac{1}{2}(8,15\times10^{-2} + 0) = 1,575\times10^{-2}\ (J)$

$P_S' = \frac{1,575\times10^{-2}}{10^{8/10}} =$

$N = \frac{N_0}{2} = 78\ \mu J$

$[v] = \frac{L}{S}$

$\Rightarrow P_{be} = \frac{1}{2}\cdot erfc(7,197) = 2,53\times10^{-5}$.

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Bài 2: abcd = 1234, suy hao (5+d) [dB/km] = 9dB/km

$P_N = \frac{(6+1)}{250}\mu W = \frac{8}{250}\mu W = 0{,}012\mu W$

$P_e \le 3{,}75(C+1)\times 10^{-5} = 3{,}75(3+1)\times 10^{-5} = 15\times 10^{-5}$

a)

mỗi chặng suy giảm 18dB = $10^{\frac{18}{10}}$ (lần)

$P_T = \frac{[(-1)^2+(1)^2+(-3)^2+(3^2)]}{50\cdot 4} = 0{,}1\ (W)$

$P_R = \frac{P_T}{10^{18/10}} \cdot d$

tỷ số SNR của tín hiệu tại Phía thu

$SRN = \frac{P_R}{P_N} = \frac{P_T}{10^{\frac{18}{10}}\cdot P_N} = \frac{0{,}1}{10^{\frac{18}{10}}\cdot 0{,}012\cdot 10^{-6}} = 132074{,}4$ (lần)

$\approx 51{,}2$ (dB)

5 đoạn → mỗi đoạn $\frac{L}{5}$ km → suy hao $9\cdot\frac{L}{5}$.

b) $S = P_R = P_T$

Exo 16898

b) $P_e = m \cdot \frac{M-1}{M} \left(1 - erf\left(\frac{\Delta V}{2\sqrt{2}\sigma}\right)\right)$

$= 5 \cdot \frac{3}{4} \cdot erfc\left(\frac{\Delta V}{2\sqrt{2}\sigma}\right)$

$P_e \leq 15 \times 10^{-5}$

$\Leftrightarrow \frac{15}{4} erfc\left(\frac{\Delta V}{2\sqrt{2}\sigma}\right) \leq 15 \times 10^{-5}$

$\Leftrightarrow erfc\left(\frac{\Delta V}{2\sqrt{2}\sigma}\right) \leq 4 \times 10^{-5}$

$\Leftrightarrow \frac{\Delta V}{2\sqrt{2}\sigma} \geq 2,9044 \Leftrightarrow \Delta V$

$P_R = \frac{\left[\left(\frac{\Delta V}{2}\right)^2 + \left(-\frac{3\Delta V}{2}\right)^2\right] \times 2}{4R} = \frac{5\Delta V^2}{4} \Rightarrow \Delta V = \sqrt{\frac{4}{5} P_R \cdot R}$

$P_R = \frac{P_T}{10^{\frac{gL}{50}}} \Rightarrow \Delta V = \sqrt{\frac{4}{5} \cdot \frac{P_T \cdot R}{10^{\frac{gL}{50}}}}$

$\sigma^2 = V_N \cdot R$

$\Rightarrow \sqrt{\frac{4}{5} \cdot \frac{P_T \cdot R}{10^{\frac{gL}{50}} \cdot 8 \cdot P_N \cdot R}} \geq 2,9044$

$\Leftrightarrow \frac{P_T}{10 P_N \cdot (2,9044)^2} \geq 10^{\frac{gL}{50}}$

$\Leftrightarrow \frac{gL}{50} \leq \log_{10}\left(\frac{P_T}{10 P_N (2,9044)^2}\right)$

$\Leftrightarrow L \leq \frac{50}{g} \cdot \log_{10}\left(\frac{0,1}{10 \cdot 0,012 \cdot 10^{-6} \cdot (2,9044)^2}\right)$

$\Leftrightarrow L \leq 27,75$

$\Rightarrow L_{max} = 27\,km\,75\,hm$

c) $P_e = \frac{M-1}{M} erfc\left(\frac{\Delta V}{2\sqrt{2m}\sigma}\right)$

$= \frac{3}{4} \cdot erfc\left(\sqrt{\frac{4}{5} \cdot \frac{P_T}{10^{\frac{g \cdot 27,75}{10}} \cdot 8 \cdot P_N \cdot 5}}\right)$

$= \frac{3}{4} erfc\left(1,328 \cdot 10^{-10}\right)$

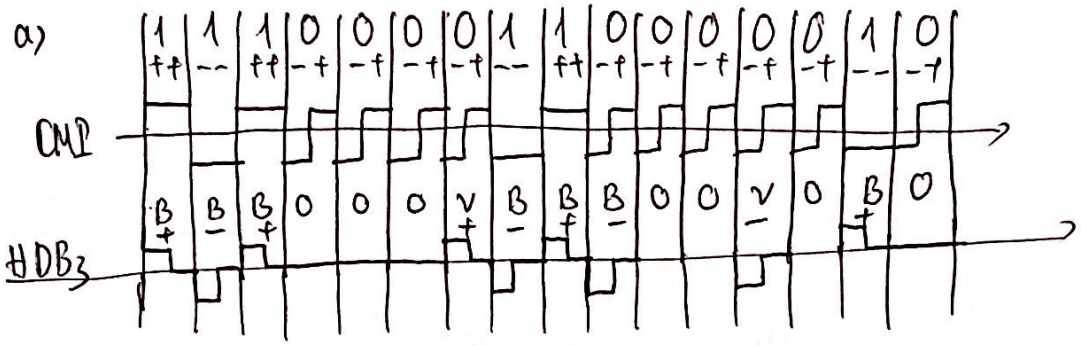
$= 0,7499$

Câu 3: NT220146898

abcd = 1234. $R_b = 128(3+1) = 512$ (kb/s) $\alpha = (0,2 + \frac{2}{20}) = 0,3$

Id-21 = 2 = 0010 → dòng bit 1110 0001 1000 0010

a)



b) 1 chu kỳ = 2 tín hiệu hình sin

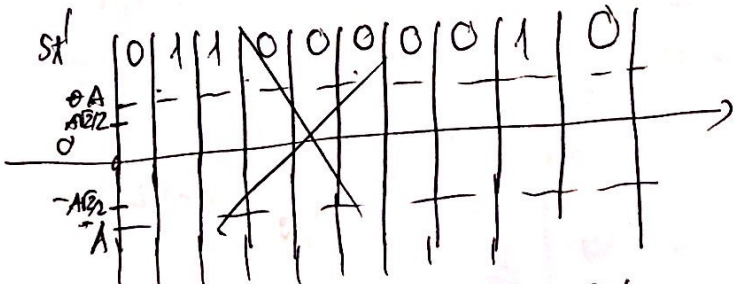
8 bit đầu = 3 chu kỳ

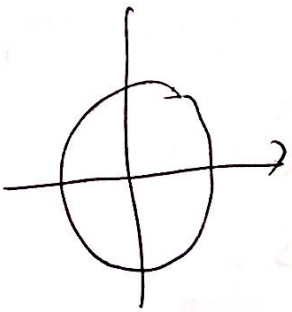
⇒ M = 4

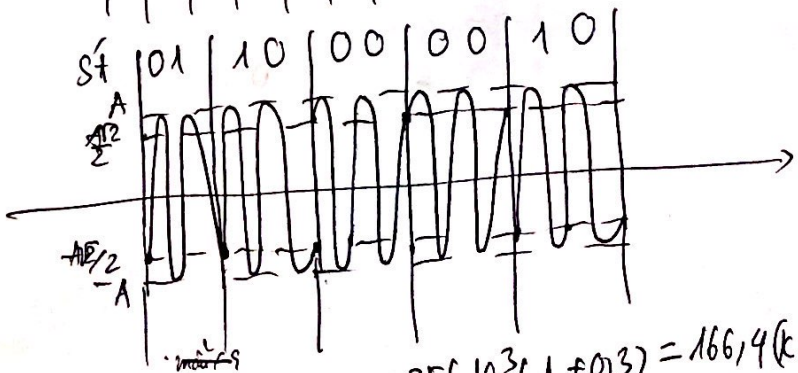
f_c = 2 tốc độ ký hiệu = $\frac{R_b \cdot \log_2 4}{\log_2 4} = \frac{512}{2} = 256 \cdot 10^3$ (mẫu²/s)

1 chu kỳ = 2 tín hiệu hình sin

⇒ f_c = 2 tốc độ ký hiệu = $512 \cdot 10^3$ (Hz) = 512 kHz







00 $(\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}j)$

10 $(\frac{1}{\sqrt{2}} + \frac{-1}{\sqrt{2}}j)$

11 $(\frac{-1}{\sqrt{2}} + \frac{-1}{\sqrt{2}}j)$

01 $(\frac{-1}{\sqrt{2}} + \frac{1}{\sqrt{2}}j)$

c) $B = \frac{v_{th}}{2}(1+\alpha) = \frac{256 \cdot 10^3}{2}(1+0,3) = 166,4$ (kHz)

⇒ dải tần số: [345,6 ÷ 678,4] kHz