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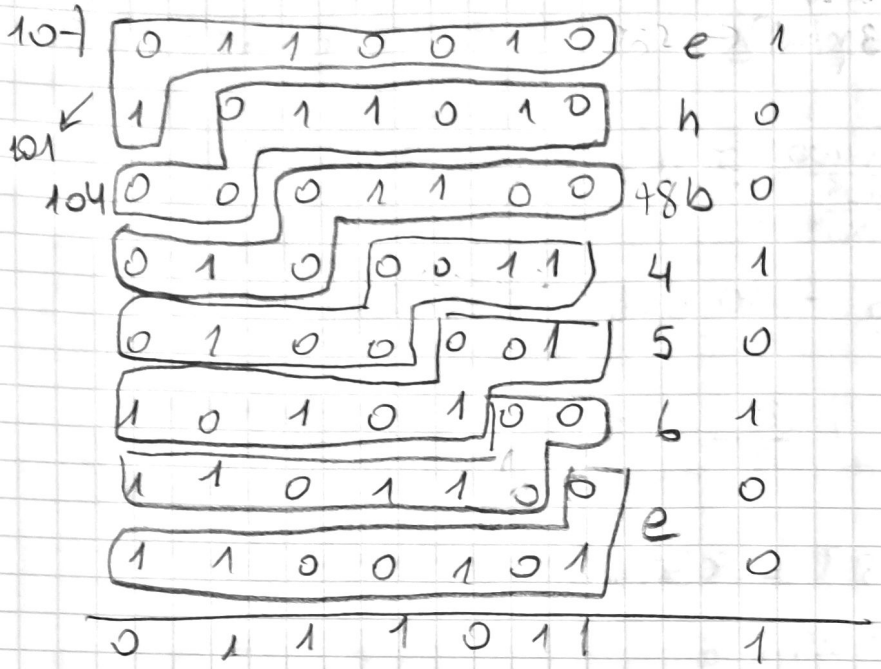
10-)



101 = e

104 = h

98 = b

eh b456e

6-) $\frac{Rb}{B} = \frac{\log_2 M}{1+\alpha}$ → $\log_2 4 = 2$

$SNR = \frac{Eb}{N_0} \times \frac{Rb}{B}$

10^{-6}, 4PSK → 11dB

$2.10^{\frac{11}{10}} = 25.178$

1-) $N_0 = kT$ (W/Hz)

$k = 1,38 \times 10^{-23}$

$T = 31 + 273 = 304 K$

$B = 42 MHz$

$10\log \frac{K}{304} + 10\log(42 \times 10^{6\ Hz})$

$-228.6 + 30 = -97.538$

$10\log k$ $10\log 10^3$

3-) $C = B \cdot \log_2\left(1+\frac{S}{N}\right)$ $\quad S = 22\times10^{-3}\,W \quad N = 7\times10^{-6}\,W$

$B = 20\,MHz$

$C = 20 \cdot \log_2\left(1+\frac{22\times10^{-3}}{7\times10^{-6}}\right) = 232.366$

8-) $P_r = P_t + G_r + G_T - P_L$ (6 dBi, 6 dBi)

$P_T = 10\log 1000 = 30\,dBm$

$P_L = 20\log\left(\frac{4\pi\times400}{\frac{3\times10^8}{600\times10^6}}\right) \cong 80.046$

$P_r = 30 + 6 + 6 - 80.046 = -38.046$

9-) $\frac{E_b}{N_0}\cdot\frac{R_0}{B} = \frac{S}{N}$, $\frac{R_0}{B} = \frac{\log_2 M}{1+r} = \frac{5}{1.5} = 3.333$

$10^{2.4} \rightarrow 251.188 \times 3.33 = 837.295$

$10\log 837.295 = 29.228$

7-) $200\,MHz \rightarrow \frac{29.2}{100} = \frac{40.8}{x}$

$x = 139.726$

2-) QPSK

$R = 200\,kHz\ \frac{\log_2 4}{1} = 400\,kbit/s$

$400 \cdot 9 = \frac{3600}{5} = 450\,kbyte$

$\frac{450}{8} = 56.25\,MB$

4-) 0 → $\frac{4}{25}$ 36 → $\frac{2}{25}$ 72 → $\frac{2}{25}$ 108 → $\frac{5}{25}$

180 → $\frac{6}{25}$ 216 → $\frac{5}{25}$ 252 → $\frac{1}{25}$

Entropy = $-\sum_i \log(P_i) P_i$

$= -\left[\frac{4}{25} \cdot \log_2\left(\frac{4}{25}\right) + \frac{2}{25} \cdot \log_2\left(\frac{2}{25}\right) \times 2 + \frac{5}{25} \log_2\left(\frac{5}{25}\right) \times 2 \right.$

$\left. + \frac{6}{25} \log_2\left(\frac{6}{25}\right) + \frac{1}{25} \log_2\left(\frac{1}{25}\right) \right] = 2.614$

min bits: $2.61 \times 25 = 65.367$

5-) $53 \times 8 = 424$ bits 53kbs data

$\frac{53 \times 10^3}{46 \times 8} = 144.02 \Rightarrow$ ms packets 46 bytes = 368 bits

$tr = 1.3$ Mbps

$\frac{145 \times 368}{1.3 \times 10^6} = 41.046\,ms + 7 = 48.046\,ms$

↓ prop delay