

1) $\frac{E_b}{N_0} \text{ (dB)} = \text{SNR (dB)} - \left(\frac{R}{B_T} \right) \text{ dB}$

$$\frac{R}{B_T} = \frac{1.4}{B_{32} M} = \frac{1.4}{B_{32} 32} = \frac{1.4}{5} = 0.28$$

$$\frac{R}{B_T} = \frac{5}{1.4} = 3.5714 = 5.5283$$

↳ $\log(3.5714) = 5.5283$

$$24 + 5.5283 = \cancel{29.5283} = \underline{29.5283}$$

2) $P_t = 1000 \text{ mW}$ $G = 2 \text{ dB}$ $P_t = 30 \text{ dBm}$
 $d = 450 \text{ m}$ $f = 800 \text{ MHz}$

$$P_L = 20 \log_{10} \left(\frac{4\pi d f}{c} \right) = 20 \log_{10} \left(\frac{4\pi \cdot 450 \cdot 800 \cdot 10^6}{3 \cdot 10^8} \right) =$$

$$= 83.567$$

$$P_r = P_t + G_t + G_r - P_L = 34 - 83.567 = -49.567 \text{ dBm}$$

Yukarı
Gevir

$$P_L = 92.4 + 20 \log(40.45 \text{ km} \cdot 0.8 \text{ GHz}) = 83.52$$

$$- 8.8733$$

3) Wired com. $P_t = 1500 \text{ mW}$ $L = 2 \text{ dB/100m}$ $d = 450 \text{ m}$

~~$L = 2 \text{ dB} \times 3 = 6 \text{ dB}$~~ $4.5 = 13.5 \text{ dBm}$ mW??
 $L = 2 \text{ dB} \times 450 = 900 \text{ dB}$

~~$1500 \text{ mW} = 31.76 \text{ dBm} - 900 \text{ dB} = -882.24 \text{ dBm}$~~

$1500 \text{ mW} = 31.76 \text{ dBm} - 13.5 \text{ dBm} = 18.26 \text{ dBm}$

$18.26 \text{ dBm} \Rightarrow 66.38 \text{ mW}$

4) SNR [dB] of 2 MHz BW channel $r=0$

$BER < 10^{-6}$ for 8PSK.

$$M=8 \quad 14.5 \text{ dB}$$

14

$$\frac{E_b}{N_0} \text{ (dB)} = \text{SNR (dB)} - \left(\frac{R}{B_T} \right) \text{ dB}$$

$$\frac{B}{B_T} = \frac{1+r}{\log_2 M} = \frac{1}{3} \quad \& \quad \frac{R}{B_T} = 3$$

$$10 \log(3) = 4.77 \text{ dB}$$

$$\frac{E_b}{N_0} = 14 = \text{SNR} - 4.77 \Rightarrow \underline{\underline{18.77 = \text{SNR}}}$$

5) 24

6) $m = 11001011$ $g = 100111$

$$\begin{array}{r} 1100101100000 \\ 100111 \\ \hline 101011100000 \\ 100111 \\ \hline 01100100000 \\ 000000 \\ \hline 101010000 \\ 100111 \\ \hline 01101000 \\ 000000 \\ \hline 1101000 \\ 100111 \\ \hline 100110 \\ 100111 \\ \hline 00001 \end{array}$$

Transmitted bitstream $b = 110001100001$

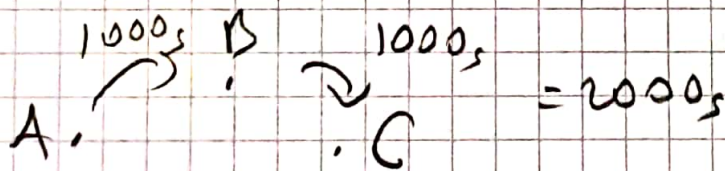
$$8) \frac{20}{0.6} \times 100m = \frac{2000}{0.6} = \underline{\underline{3333.3}}$$

$$9) c = \lambda \cdot f \rightarrow \frac{3 \cdot 10^8 \frac{m}{s}}{1705 \cdot 10^4 Hz} = \lambda = 0.176 m$$

$$\textcircled{-59.9715} = P_r$$

$$P_r = \frac{P_t \cdot G_t \cdot G_r \cdot \lambda^2}{(4\pi R)^2}$$

$$\underline{\underline{R = 700m}}$$



$$\frac{1000}{5} s = \underline{\underline{200}}$$

10s = 1st packet

1045s = 2nd

$$10 + \underbrace{(200-1)}_{199} \cdot 5 = 995 + 10 = \underline{\underline{1005s}}$$