Siskom 1

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2. $R_b = 1\ Mbps$
$= 10^6\ bps$
$N_0 = 10^{-12}\ W/Hz$
$P_e = 10^{-5}$

$$P_e = 10^{-5} = Q(x) = Q\left(\sqrt{\frac{2E_b}{N_0}}\right)$$

$x = 4,27$

a $$4,27 = \sqrt{\frac{2E_b}{N_0}}$$

$$4,27^2 = \frac{2E_b}{N_0}$$

$$E_b = \frac{4,27^2 \cdot 10^{-12}}{2} = 9,12 \times 10^{-12}\ J$$

$$P = E_b \cdot R_b = 9,12 \times 10^{-12} \cdot 10^6 = 9,12 \times 10^{-6}\ W$$

$$A = \sqrt{2 \cdot E_b \cdot R_b}$$

$$= \sqrt{2 \cdot 9,12 \times 10^{-12} \cdot 10^6} = 4,27 \times 10^{-3}$$ ✓

$$= 4,27\ mV$$

b. $$4,27 = \sqrt{\frac{E_b}{N_0}}$$

$$E_b = 4,27^2 \cdot N_0 = 4,27^2 \cdot 10^{-12} = 1,82 \times 10^{-11}\ J$$

$$P = E_b \cdot R_b = 1,82 \times 10^{-11} \cdot 10^6$$

$$= 1,82 \times 10^{-5}\ W$$

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$$A = \sqrt{2 \cdot E_b \cdot R_b} = \sqrt{2 \cdot P}$$

$$= \sqrt{2 \cdot 1{,}82 \times 10^{-5}} = 6{,}03 \times 10^{-3}\ V$$
$$= 6{,}03\ mV$$

c. $4{,}27 = \sqrt{\frac{E_b}{N_0}}$

$$E_b = 4{,}27^2 \cdot N_0 = 4{,}27^2 \cdot 10^{-12}$$
$$= 1{,}82 \times 10^{-11}\ J$$

$$P = E_b \cdot R_b = 1{,}82 \times 10^{-11} \cdot 10^6 = 1{,}82 \times 10^{-5}\ W$$

$$E_b = \frac{A^2 T_b}{4}$$

$$A = \sqrt{4 \cdot E_b \cdot R_b}$$

$$= \sqrt{4 \cdot P} = 2\sqrt{1{,}82 \times 10^{-5}} = 8{,}53 \times 10^{-3}\ V$$
$$= 8{,}53\ mV$$