

2017218007 文华 物联网17-2

ch7.

7-1. 解:

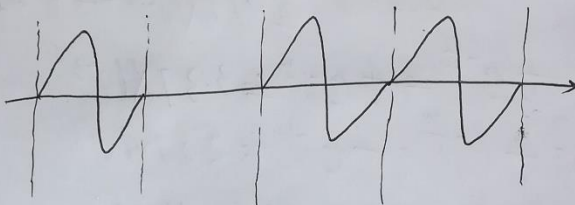
(1) 载波速率: $f_c = \frac{8\pi \times 10^3}{2\pi} = 4 \times 10^3 \text{ Hz}$.

码速率: $R_B = 2000 \text{ Baud}$

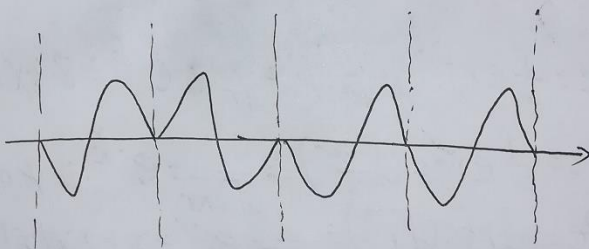
载波周期: $\frac{4 \times 10^3}{2000} = 2 \text{ (个)}$.

(2) 设发送的二进制信号为 1011.

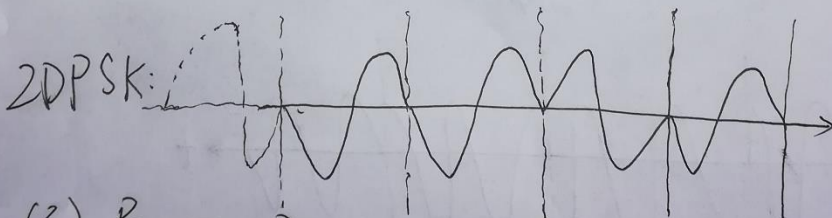
2ASK:



2PSK:



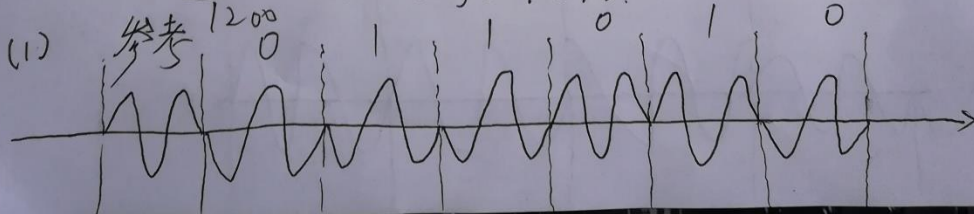
2DPSK:



(3) $B_{2ASK} = B_{2PSK} = B_{2DPSK} = 2R_B = 4000 \text{ Hz}$.

7-5. 解: $\frac{1800}{1200} = 1.5 \Rightarrow f_c = 1.5 R_B$.

(1) 参考



(2)

参考

0

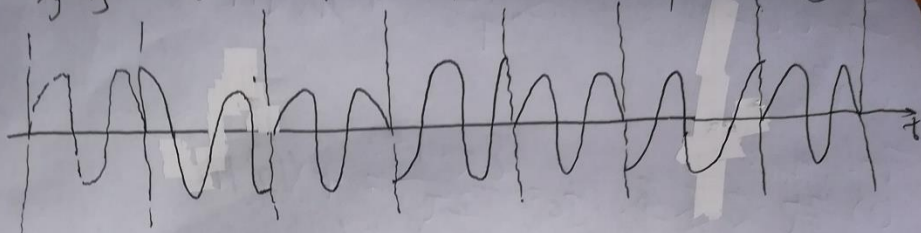
1

1

0

1

0



7-9. 解: $B = B_{2ASK} = B_{2PSK} = B_{2DPSK} = 2R_B = 4 \times 10^4 \text{ Hz}$

噪声功率: $\sigma_n^2 = n_0 B = 4 \times 10^{-15} \times 4 \times 10^4 = 1.6 \times 10^{-10} \text{ W}$

输入信噪比: $\gamma = \frac{a^2}{2\sigma_n^2} = \frac{(800 \times 10^{-6})^2}{2 \times 1.6 \times 10^{-10}} \approx 20 \gg 1$

(1) 非相干:

2ASK: $P_e = \frac{1}{2} e^{-\frac{\gamma}{4}} = \frac{1}{2} e^{-5} \approx 3.37 \times 10^{-3}$

2FSK: $P_e = \frac{1}{2} e^{-\frac{\gamma}{2}} = \frac{1}{2} e^{-10} \approx 2.27 \times 10^{-5}$

2DPSK: $P_e = \frac{1}{2} e^{-\gamma} = \frac{1}{2} e^{-20} \approx 10^{-9}$

(2) 相干:

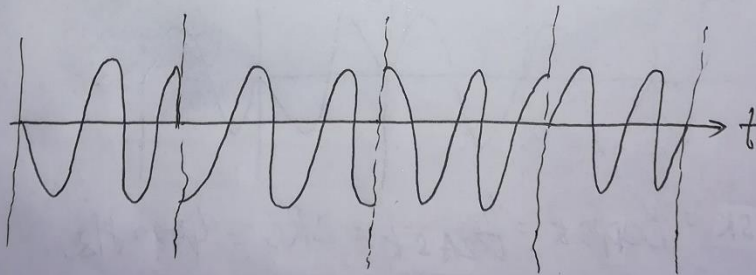
2ASK: $P_e = \frac{1}{2} \text{erfc}\left(\sqrt{\frac{\gamma}{4}}\right) \approx \frac{1}{\sqrt{2\pi\gamma}} e^{-\frac{\gamma}{4}} \approx 8.5 \times 10^{-4}$

2FSK: $P_e = \frac{1}{2} \text{erfc}\left(\sqrt{\frac{\gamma}{2}}\right) \approx \frac{1}{\sqrt{2\pi\gamma}} e^{-\frac{\gamma}{2}} \approx 4.05 \times 10^{-6}$

2DPSK: $P_e = \text{erfc}(\sqrt{\gamma}) \approx \frac{1}{\sqrt{2\pi\gamma}} e^{-\gamma} \approx 2.52 \times 10^{-9}$

7-13. 解:

QPSK:



QDPSK:

