

2.3-2 All the signals are shown in Fig. S2.3-2.

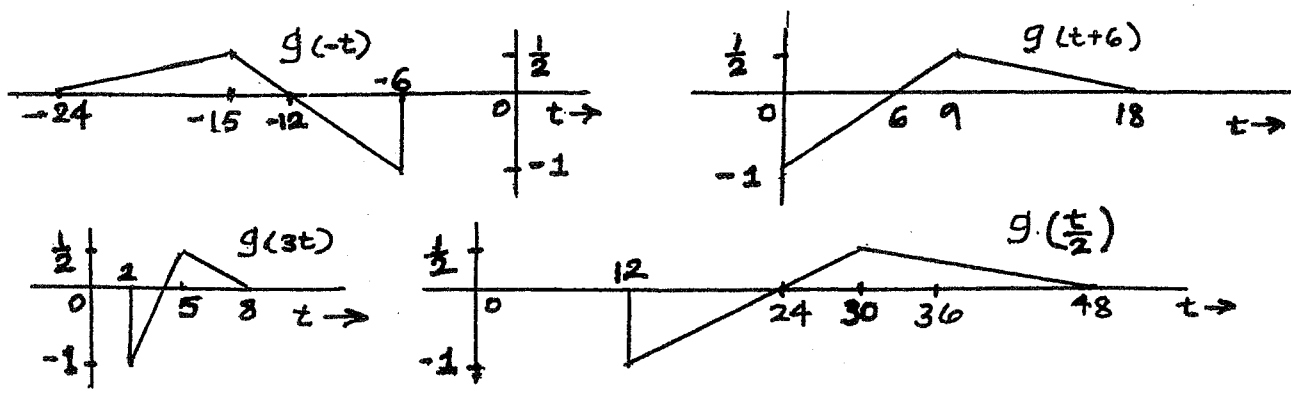


Fig. S2.3-2

3.3-6 Fig. (a) The signal $g(t)$ in this case is a triangle pulse $\Delta(\frac{t}{2\pi})$ (Fig. S3.3-6) multiplied by $\cos 10t$.

$$g(t) = \Delta\left(\frac{t}{2\pi}\right) \cos 10t$$

Also from Table 3.1 (pair 19) $\Delta(\frac{t}{2\pi}) \iff \pi \text{sinc}^2(\frac{\pi\omega}{2})$ From the modulation property (3.35), it follows that

$$g(t) = \Delta\left(\frac{t}{2\pi}\right) \cos 10t \iff \frac{\pi}{2} \left\{ \text{sinc}^2\left[\frac{\pi(\omega - 10)}{2}\right] + \text{sinc}^2\left[\frac{\pi(\omega + 10)}{2}\right] \right\}$$

The Fourier transform in this case is a real function and we need only the amplitude spectrum in this case as shown in Fig. S3.3-6a.

Fig. (b) The signal $g(t)$ here is the same as the signal in Fig. (a) delayed by 2π . From time shifting property, its Fourier transform is the same as in part (a) multiplied by $e^{-j\omega(2\pi)}$. Therefore

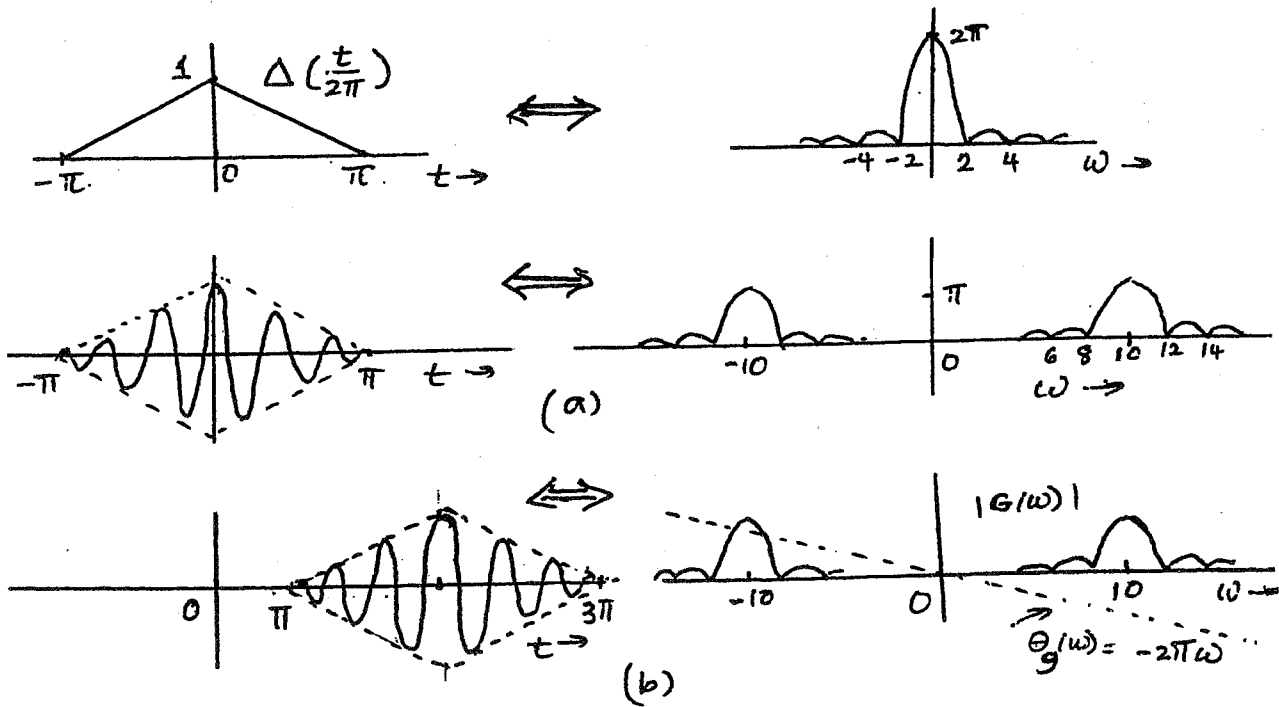


Fig. S3.3-6

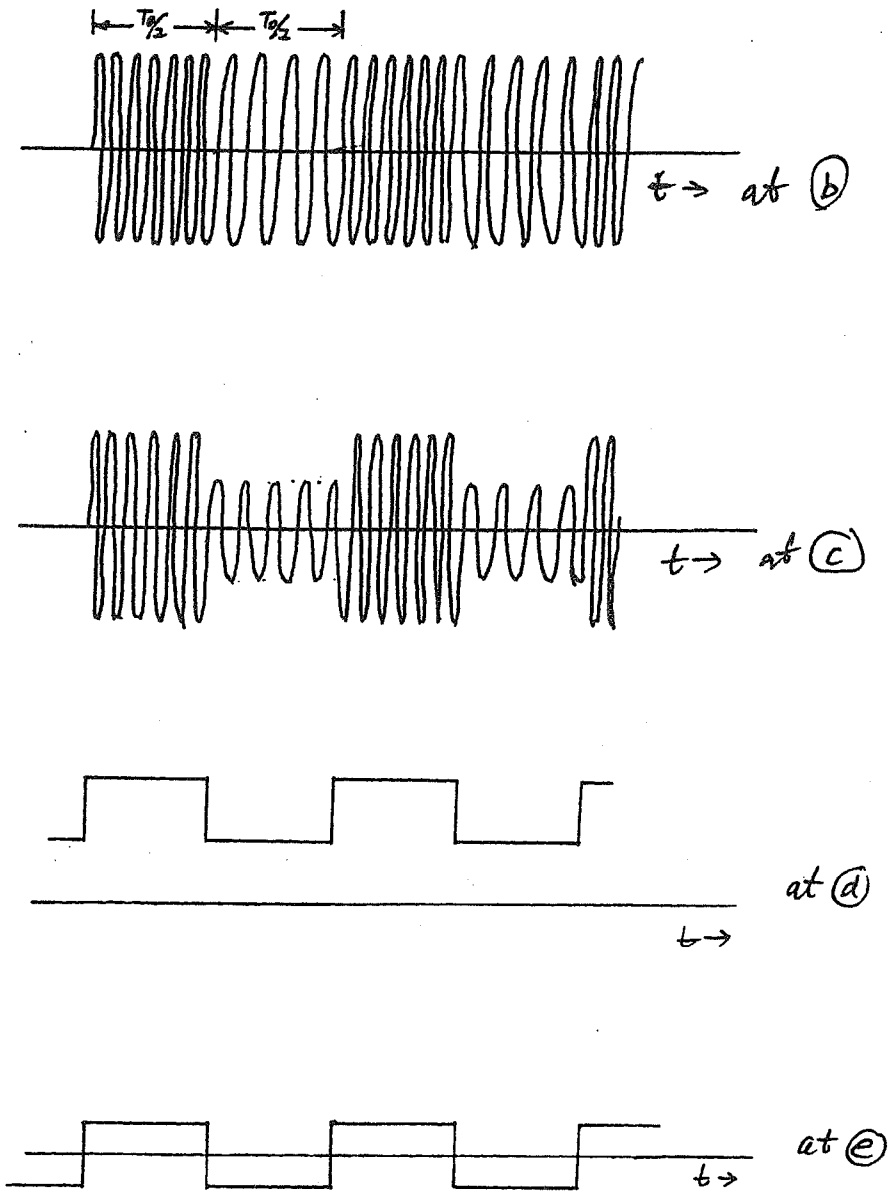


Fig. S5.4-2

5.4-2 Figure S5.4-2 shows the waveforms at points b, c, d, and e. The figure is self explanatory.

7.7-2 Sampling rate = $2 \times 4000 \times 1.25 = 10,000$ Hz.

$$\text{Quantization error} = \frac{m_p}{L} = 0.001m_p \Rightarrow L = 1000$$

Because L is a power of 2, we select $L = 1024 = 2^{10}$. Hence, $n = 10$ bits/sample.

(a) Each 4-ary pulse conveys $\log_2 4 = 2$ bits of information. Hence, we need $\frac{10}{2} = 5$ 4-ary pulses/sample, and a total of $5 \times 10,000 = 50,000$ 4-ary pulses/second. Therefore, the minimum transmission bandwidth is

$$\frac{50,000}{2} = 25 \text{ kHz.}$$

(c)
$$B_T = \frac{R_b(1+r)}{2} = \frac{50,000(1.25)}{2} = 31.25 \text{ kHz.}$$

7.8-1 (a) Baseband polar signal at a rate of 1Mbits/sec and using full width pulses has $BW = 1$ MHz. PSK doubles the BW to 2MHz.

(b) FSK can be viewed as a sum of 2 ASK signals. Each ASK signal $BW = 2$ MHz. The first ASK signal occupies a band $f_{c0} \pm 1$ MHz, and the second ASK signal occupies a band $f_{c1} \pm 1$ MHz. Hence, the bandwidth is $2 \text{ MHz} + 100 \text{ kHz} = 2.1 \text{ MHz}$.

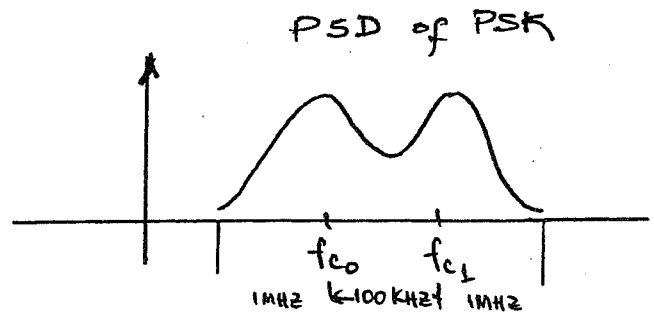


Fig.S7.8-1