Problem 2.20

(a) The even part $g_e(t)$ of a pulse $g(t)$ is given by

$$g_e(t) = \frac{1}{2}[g(t) + g(-t)]$$

Therefore, for $g(t) = A\,\mathrm{rect}\left(\frac{t}{T} - \frac{1}{2}\right)$ we obtain

$$g_e(t) = \frac{A}{2}\left[\mathrm{rect}\left(\frac{t}{T} - \frac{1}{2}\right) + \mathrm{rect}\left(-\frac{t}{T} - \frac{1}{2}\right)\right]$$

$$= \frac{A}{2}\left[\mathrm{rect}\left(\frac{t}{2T}\right)\right]$$

which is shown illustrated in Fig. 1:

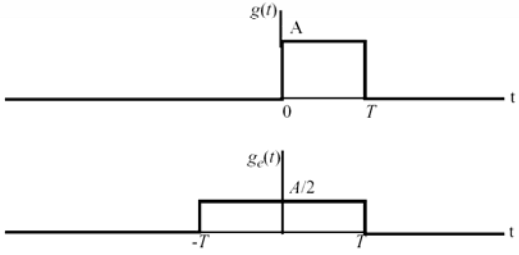

Figure 1

The odd part of $g(t)$ is defined by

$$g_o(t) = \frac{1}{2}[g(t) - g(-t)]$$

$$= \frac{A}{2}\left[\mathrm{rect}\left(\frac{t}{T} - \frac{1}{2}\right) - \mathrm{rect}\left(-\frac{t}{T} - \frac{1}{2}\right)\right]$$

which is illustrated in Fig. 2:

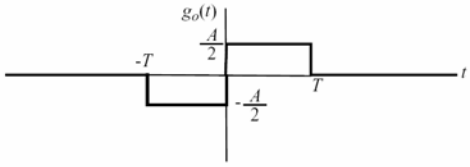

Figure 2

(b) The Fourier transform of the even part is

$$G_e(f) = AT\,\mathrm{sinc}(2fT)$$

The Fourier transform of the odd part is

$$G_o(f) = \frac{AT}{2}\mathrm{sinc}(fT)\exp(-j\pi fT) - \frac{AT}{2}\mathrm{sinc}(fT)\exp(j\pi fT)$$

$$= \frac{AT}{j}\mathrm{sinc}(fT)\sin(\pi fT)$$