3-8. 解:

(1) $P_o(f) = P_i(f) \cdot |H(f)|^2$

$= \frac{n_0}{2} \cdot |H(f)|^2$

$= \begin{cases} \frac{n_0}{2} & f_c - \frac{B}{2} \le |f| \le f_c + \frac{B}{2} \\ 0 & \text{else} \end{cases}$

$R_o(\tau) = \int_{-\infty}^{+\infty} P_o(f) e^{j2\pi f\tau} df$

$= n_0 B Sa(B\pi\tau)\cos 2\pi f_c \tau$.

(2) $N_o = R_o(0) = n_0 B$.

(3) $f(x) = \frac{1}{\sqrt{2\pi}\sigma} \exp[-\frac{x^2}{2\sigma^2}]$

$= \frac{1}{\sqrt{2\pi n_0 B}} \exp[-\frac{x^2}{2n_0 B}]$.

3-9. 解:

(1) $RC \Rightarrow H(w) = \frac{1}{1+jwRC}$

$P_o(w) = \frac{n_0}{2} \cdot |H(w)|^2 = \frac{n_0}{2} \cdot \frac{1}{1+(wRC)^2}$.

$\therefore R_o(\tau) = \frac{n_0}{4RC} e^{-\frac{1}{RC}|\tau|}$.

(2)

$f(x) = \frac{1}{\sqrt{2\pi}\sigma} \exp(-\frac{x^2}{2\sigma^2})$

$= \sqrt{\frac{2RC}{\pi n_0}} \exp(-\frac{2RC}{n_0} x^2)$.

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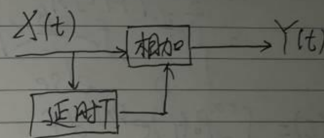
3-7. 解：

(1)



(2) $h(t)=\delta(t)+\delta(t-T)$

$$H(w)=1+e^{-jwT}=e^{-j\frac{wT}{2}}\left(e^{j\frac{wT}{2}}+e^{-j\frac{wT}{2}}\right)$$

$$=2\cos\frac{wT}{2}e^{-j\frac{wT}{2}}$$

$$P_Y(w)=|H(w)|^2P_X(w)=2(1+\cos wT)P_X(w)$$

Fourier 逆变换：

$Y(t)\Leftrightarrow R_Y(\tau)\Rightarrow$

$$R_Y(\tau)=2R_X(\tau)+R_X(\tau-T)+R_X(\tau+T)$$

(3) $R_Y(0)=2R_X(0)+R_X(-T)+R_X(+T)$

$$=2R_X(0)+2R_X(+T).$$