Chapter 2

(1) $<v(t)>=\frac{1}{T_0}\int_{T_0} v(t)dt$; (2) $p \triangleq <|v(t)|^2>=\frac{1}{T}\int_{T_0}|v(t)|^2 dt$; (3) $<v(t-t_0)>=\frac{1}{T}\int_{T_0}|v(t)|^2 dt$, $C_n=\frac{1}{T_0}\int_{T_0} v(t)e^{-j2\pi nf_0 t}dt$

(4) $\frac{A\tau}{T_0}\sin c(\tau n f_0)$; (5) $A\tau \operatorname{sinc}(f\tau)=F[\pi(t/\tau)]$; (6) $A\tau \operatorname{sinc}^2(f\tau)=F[\Lambda(t/\tau)]$; (7) $\begin{cases} z(t)=V(t) \\ F[z(t)]=v(-f)=Z(f) \end{cases}$;

Chapter 3

(1) $E_y=\int_{-\infty}^{+\infty}|H(f)|^2|X(f)|^2 df$; (2) $|H(f)|=|k|$ $\arg H(f)=-2\pi t_d f$; (3) $H_{eq}(f)=\frac{ke^{-j\omega t_d}}{H(c)}$

(4) $H_{eq}(f)=\left(\sum_{m=-M}^{M} c_m e^{jw_m\Delta}\right)e^{-jw_m\Delta}$; (5) $g \triangleq Pout/Pin$, $Pout_{dbm}=g_{db}+Pin_{dbm}$, $P_{dbm}=10\log\frac{P}{1mw}$

(6) $L\triangleq\frac{1}{g}=\frac{Pin}{Pout}$, $Pout_{db}=Pin_{db}-L_{db}$; (7) $Pout=10^{-(\alpha L/10)}Pin$ $\quad L_{db}=\alpha L$;

(8) $BPF: H(f)=\begin{cases} ke^{-jwt_d} & f_L \le |f| \le fu \\ 0 & otherwise \end{cases}$; (9) $LPF: H(f)=ke^{-jwt_d}\prod\left(\frac{f}{2B}\right)$; (10) $Baterworth: H(f)=\frac{1}{\sqrt{1+(f/B)^{2n}}}$

(11) $H_Q(f)=-j\operatorname{sgn}(f)=\begin{cases} -j & f>0 \\ +j & f<0 \end{cases}$; (12) $F\{\hat{x}(t)\}=(-j\operatorname{sgn} f)x(f)$; (13) $|<v(t)w^*(t)>|^2 \le P_v P_w$

(14) $R_{vw}(\tau)\triangleq<v(t)w^*(t-\tau)=<v(t+\tau)w^*(t)>$; (15) $R_{vw}(\tau)|^2\le P_v P_w$, $R_{wv}(\tau)=R^*_{vw}(-\tau), R_v(0)=P_v$, $|P_v(\tau)|\le R_v(0)$

(16) $v(t)=c_v e^{jw_v t}$, $w(t)=c_w e^{jw_w t}$, $R_{vw}(t)\begin{cases} 0 & w_w \ne w_v \\ c_v c_w^* e^{jw_v t} & w_w=w_v \end{cases}$; (17) $R_{vw}(\tau)\triangleq\int_{-\infty}^{+\infty}v(t)w^*(t-\tau)dt$, $R_v(\tau)\triangleq R_{vv}(\tau)$, $|R_{vw}(\tau)|^2\le E_v E_w$;

(18) $\int_{-\infty}^{+\infty}G_v(f)df=R_v(0)$, $G_y(f)=|H(f)|^2 G_x(f)$, $R_v(\tau)\leftrightarrow G_v(f)$

Chapter 4

(1) $v_{bp}(t)=A(t)\cos[\omega_c t+\phi(t)]$; (2) $v_i\triangleq A(t)\cos\phi(t), v_q(t)\triangleq A(t)\sin\phi(t), A(t)=\sqrt{v_i^2(t)+v_q^2(t)}$, $\phi(t)=tg^{-1}\frac{v_q(t)}{v_i(t)}$;

(3) $v_{lp}(t)=\frac{1}{2}A(t)e^{j\Phi(t)}$, $v_{bp}(t)=2\operatorname{Re}\{v_{lp}(t)e^{j\omega ct}\}$; (4) $Am: A(t)=A_c[1+\mu x(t)]$, $x_c(t)=A_c[1+\mu x(t)]\cos\omega_c t$;

(5) $S_T=\frac{1}{2}A_c^2(1+\mu^2 s_x)$; (6) $DSB: x_c(t)=A_c x(t)=A_c x(t)Cos\,\omega_c t$, $s_T=\frac{1}{2}A_c^2 S_x$;

(7) $SSB: x_c(t)=\frac{1}{2}A_c A_m\cos(\omega_c\pm\omega_m)t, x_{LP}(t)=\frac{1}{2}A_c x(t), A(t)=\frac{1}{2}A_c\sqrt{x^2(t)+\hat{x}(t)^2}, x_c(t)=\frac{1}{2}A_c[x(t)\cos\omega_c t\mp\hat{x}(t)\sin\omega_c t]$;

Chapter 5

(1) FM & $PM: x_c(t)=A_c\cos(\omega_c t+\phi(t))$; (2) $\theta_c(t)=\omega_c t+\phi(t)$ & $\frac{1}{2\pi}\theta=f(t)$; (3) $x_c(f)=\frac{1}{2}A_c\,\delta(f-f_c)+\frac{j}{2}A_c\Phi(f-f_c)$ $F>0$;

(4) $FM: \phi(t)=2\pi f_\Delta\int_0^t x(\lambda)d\lambda, f(t)=f_c+f_\Delta x(t)$; $PM: \phi(t)=\phi_\Delta x(t), f(t)=\frac{1}{2\pi}\phi_\Delta\dot{x}(t)+f_c$; (5) $\begin{cases} \phi(t)=\beta\sin\omega_m t \\ \beta=\begin{cases} \phi_\Delta A_m & PM \\ (A_m/f_m)f_\Delta & FM \end{cases} \end{cases}$;

(6) $x_c(t)=A_c\sum_{n=-\infty}^{+\infty}J_n(\beta)\cos(w_c+n\,w_m)t$; (7) $\beta=2M(\beta)f_m$ $when$ $M(\beta)>>1$;

(8) $FM: B_T=2(D+1)W$, $for\ D>>1$ & $D<<1, D=\frac{f_\Delta}{W}$, $\quad PM: B_T=2(\phi_\Delta+1)W$;

Chapter 6

(1) $x_\delta(t)=x(t)\,\delta(t)$ $f_s>2w$; (2) $S_\delta(t)=\sum_{k=-\infty}^{+\infty}\delta(t-kts)$; (3) $x_\delta(t)\triangleq x(t)S_\delta(t)$;

(4) $S_\delta(f)=F_s\sum_{n=-\infty}^{+\infty}\delta(f-nf_s)$; (5) $x_p(t)=\sum_k x(kT_s)P(t-kT_s)$; (6) $X_p(f)=p(f)\left[f_s\sum_n x(f-nf_s)\right]=p(f)x_\delta(f)$;

(7) $PDM: \tau_k=\tau_0[1+\mu x(kT_s)]$ $\quad PPM: t_k=kT_s+t_d+t_0(kT_s)$; (8) $B_T>>\frac{1}{2t_r}$; (9) $PAM: A_0[1+\mu x(t)]$