第十周:

周二 6.4（7，8）6.7（5，6，10）

周四 6.1（3，11，16） 6.3（3）6.7（1，3）

6.4-7

$$F(\omega)=\begin{cases}\cos^2(\frac{\pi\omega}{2W}),|\omega|<W\\0,|\omega|<W\end{cases}=\begin{cases}\frac{1}{2}(1+\cos(\frac{\pi\omega}{W})),|\omega|<W\\0,|\omega|<W\end{cases}$$

$$\Rightarrow f(t)=\frac{W}{2\pi}\frac{Sa(Wt)}{1-(Wt/\pi)^2}$$

6.4-8 $F(\Omega)=|F(\Omega)|e^{-j2\Omega}$

令$Y(\Omega)=|F(\Omega)|=u\left(\Omega+\frac{\pi}{2}\right)+u\left(\Omega+\frac{\pi}{4}\right)-u\left(\Omega-\frac{\pi}{4}\right)-u\left(\Omega-\frac{\pi}{2}\right)$

$$\therefore y[n]=\frac{1}{2}Sa\left(\frac{\pi}{2}n\right)+\frac{1}{4}Sa\left(\frac{\pi}{4}n\right)$$

$$f[n]=y[n-2]=\frac{1}{2}Sa\left(\frac{\pi}{2}(n-2)\right)+\frac{1}{4}Sa\left(\frac{\pi}{4}(n-2)\right)$$

6.7-5 $f(t)=e^{-t}u(t)-e^{-(t-T)}u(t-T)$

6.7-6 $f[n]=a^nu[n]-a^{n-N}u[n-N]$

6.7-10 $f(t)=\cos\pi tu(t)+\cos\pi(t-1)u(t-1)$

6.1-3 $f(t)=[te^{-2t}\cos 4t]u(t)$

$$\because e^{-2t}\cos 4tu(t)\Leftrightarrow\frac{2+j\omega}{(2+j\omega)^2+4^2}$$

$$\therefore[te^{-2t}\cos 4t]u(t)\Leftrightarrow j\frac{d\frac{2+j\omega}{(2+j\omega)^2+4^2}}{d\omega}=-\frac{-(2+j\omega)^2+16}{[(2+j\omega)^2+16]^2}$$

$$\Rightarrow F(\omega)=\frac{(2+j\omega)^2-16}{[(2+j\omega)^2+16]^2}$$

6.1-11 $f[n]=(1-2n)0.5^nu[n+1]=2\bullet0.5^{n+1}u[n+1]-4n\bullet0.5^{n+1}u[n+1]$

$$0.5^nu[n]\leftrightarrow\frac{1}{1-0.5e^{-j\Omega}}$$

$$0.5^{n+1}u[n+1]\leftrightarrow\frac{e^{j\Omega}}{1-0.5e^{-j\Omega}}$$

$$n0.5^{n+1}u[n+1]\leftrightarrow j\frac{d\frac{e^{j\Omega}}{1-0.5e^{-j\Omega}}}{d\Omega}=-\frac{e^{j\Omega}-1}{\left(1-0.5e^{-j\Omega}\right)^2}$$

$$f[n]\leftrightarrow\frac{2e^{j\Omega}}{1-0.5e^{-j\Omega}}+4\frac{e^{j\Omega}-1}{\left(1-0.5e^{-j\Omega}\right)^2}$$

$$F(\Omega)=\frac{6e^{j\Omega}-5}{\left(1-0.5e^{-j\Omega}\right)^2}$$

6.1-16

$$f(t) = -[u(t+2) - u(t+1)] + t[u(t+1) - u(t-1)] + [u(t-1) - u(t-2)]$$
$$= (t+1)u(t+1) - (t-1)u(t-1) - u(t+2) - u(t-2)$$

$$\because u(t) \Leftrightarrow \frac{1}{s}, tu(t) \Leftrightarrow \frac{1}{s^2}$$

$$\therefore (t+1)u(t+1) \Leftrightarrow \frac{1}{s^2}e^{s}, (t-1)u(t-1) \Leftrightarrow \frac{1}{s^2}e^{-s},$$

$$u(t+2) \Leftrightarrow \frac{1}{s}e^{2s}, u(t-2) \Leftrightarrow \frac{1}{s}e^{-2s}$$

$$\therefore F(s) = \frac{1}{s^2}e^{s} - \frac{1}{s^2}e^{-s} - \frac{1}{s}e^{2s} - \frac{1}{s}e^{-2s} = \frac{e^{s} - e^{-s}}{s^2} - \frac{e^{2s} + e^{-2s}}{s}$$

$$\Rightarrow F(\omega) = \frac{e^{j\omega} - e^{-j\omega}}{(j\omega)^2} - \frac{e^{2j\omega} + e^{-2j\omega}}{j\omega} = -\frac{2j\sin\omega}{\omega^2} - \frac{2\cos 2\omega}{j\omega}$$

6.3-3

$$x(t) = te^{-a(t-1)}u(t+1)$$
$$= te^{2a}e^{-a(t+1)}u(t+1)$$

$$e^{-at}u(t) \Leftrightarrow \frac{1}{s+a}$$

$$e^{-a(t+1)}u(t+1) \Leftrightarrow \frac{e^{s}}{s+a}$$

$$te^{2a}e^{-a(t+1)}u(t+1) \Leftrightarrow X(s) = -e^{2a}\frac{d\dfrac{e^{s}}{s+a}}{ds} = -e^{2a}\frac{e^{s}(s+a-1)}{(s+a)^2}$$

6.7-1

$$X(s) = \frac{s^2e^{-2(s+1)}}{s^2+2s+5} = \frac{s^2e^{-2(s+1)}}{(s+1)^2+4}$$

$$\frac{e^{-2(s+1)}}{(s+1)^2+4} \Leftrightarrow 0.5e^{-t}\sin(2t-4)u(t-2)$$

$$\frac{s^2e^{-2(s+1)}}{(s+1)^2+4} \Leftrightarrow e^{-2}\delta(t-2) - e^{-t}[2\cos(2t-4) + 1.5\sin(2t-4)]u(t-2)$$

6.7-3

$$X(z) = \frac{2z}{\left(1-az^{-1}\right)^3}$$

$$\frac{1}{\left(1-az^{-1}\right)^3} \leftrightarrow -\frac{(n+3-1)!}{n!(3-1)!}a^{n}u[-n-1] = -\frac{(n+2)(n+1)}{2}a^{n}u[-n-1]$$

$$\therefore x[n] = -(n+3)(n+2)a^{n+1}u[-n-2]$$