Homework 9

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9.1)

(1) $x_1(k) = \{\underline{1}, 2, 5, 7, 0, 1\}$

$\quad X(z) = 1 + 2z^{-1} + 5z^{-2} + 7z^{-3} + z^{-5}$

(2) $x_2(k) = \{1, 2, \underline{5}, 7, 0, 1\}$

$\quad X(z) = z^2 + 2z + 5 + 7z^{-1} + z^{-3}$

(3) $x_3(k) = \{\underline{0}, 0, 1, 2, 5, 7, 0, 1\}$

$\quad X(z) = z^{-2} + 2z^{-3} + 5z^{-4} + 7z^{-5} + z^{-7}$

(4) $x_4(k) = \{2, 4, \underline{5}, 7, 0, 1\}$

$\quad X(z) = 2z^2 + 4z + 5 + 7z^{-1} + z^{-3}$

(5) $x_5(k) = \delta(k)$

$\quad X(z) = 1$

(6) $x_6(k) = \delta(k-m), m > 0$

$\quad X(z) = z^{-m}$

(7) $x_7(k) = \delta(k+m), m > 0$

$\quad X(z) = z^{m}$

9.2)

$$X[z] = \frac{8z - 19}{(z-2)(z-5)}$$

$$\frac{X[z]}{z} = \frac{8z - 19}{z(z-2)(z-5)}$$

$$= \frac{R_1}{z} + \frac{R_2}{z-2} + \frac{R_3}{z-5}$$

$\quad \times \quad \dfrac{R_1}{z} + \dfrac{R_2}{z-2} + \dfrac{R_3}{z-5} = \dfrac{8z - 19}{z(z-2)(z-5)}$

$(\Leftrightarrow)\ R_1(z-2)(z-5) + R_2 z(z-5) + R_3 z(z-2) = 8z - 19 \quad (1)$

$$\Leftrightarrow R_1(z-2)(z-3) + R_2 z(z-3) + R_3 z(z-2) = 8z - 19 \quad (1)$$

+ At $z = 0$

$(1) \Leftrightarrow 6R_1 = -19$

$\Leftrightarrow R_1 = \dfrac{-19}{6}$

+ At $z = 2$

$(1) \Leftrightarrow -2R_2 = -3$

$\Leftrightarrow R_2 = \dfrac{3}{2}$

+ At $z = 3$

$(1) \Leftrightarrow 3R_3 = 5$

$\Leftrightarrow R_3 = \dfrac{5}{3}$

$$\dfrac{X[z]}{z} = \dfrac{-19}{6} \cdot \dfrac{1}{z} + \dfrac{3}{2} \cdot \dfrac{1}{z-2} + \dfrac{5}{3} \cdot \dfrac{1}{z-3}$$

$$\Rightarrow X[z] = \dfrac{-19}{6} + \dfrac{3}{2} \cdot \dfrac{z}{z-2} + \dfrac{5}{3} \cdot \dfrac{z}{z-3}$$

$$= \dfrac{-19}{6} + \dfrac{3}{2} \cdot \dfrac{1}{1-2z^{-1}} + \dfrac{5}{3} \cdot \dfrac{1}{1-3z^{-1}}$$

$$\Rightarrow x[k] = \dfrac{-19}{6} \delta[k] + \dfrac{3}{2} 2^k + \dfrac{5}{3} 3^k$$

9.3)

(1) $x_1(k) = \{ \underline{1}, 2, 5, 7, 0, 1 \}$

$X(z) = 1 + 2z^{-1} + 5z^{-2} + 7z^{-3} + z^{-5}$

(2) $x_2(k) = \{ 1, 2, \underline{5}, 7, 0, 1 \}$

$X(z) = 5 + 7z^{-1} + z^{-3}$

(3) $x_3(k) = \{ \underline{0}, 0, 1, 2, 5, 7, 0, 1 \}$

$X(z) = z^{-2} + 2z^{-3} + 5z^{-4} + 7z^{-5} + z^{-7}$

(4) $x_4(k) = \{ 2, 4, \underline{5}, 7, 0, 1 \}$

$X(z) = 5 + 7z^{-1} + z^{-3}$