

Example 2.17

$$Q: x(k+2) + 3x(k+1) + 2x(k) = 0$$

$$x(0) = 0 \quad x(1) = 1 \quad \text{find } x(k)$$

Solution

$$z^2 x(z) - z^2 x(0) - z x(1)$$

$$+ 3z x(z) - 3z x(0) + 2x(z) = 0$$

$$z^2 x(z) - z + 3z x(z) + 2x(z) = 0$$

$$(z^2 + 3z + 2)x(z) = z$$

$$x(z) = \frac{z}{z^2 + 3z + 2}$$

$$= \frac{z^{-1}}{1 + 3z^{-1} + 2z^{-2}}$$

$$= \frac{z^{-1}}{(1 + 2z^{-1})(1 + z^{-1})}$$

$$= \frac{A}{1 + 2z^{-1}} + \frac{B}{1 + z^{-1}}$$

$$A + A z^{-1} + B + 2B z^{-1} \quad \begin{cases} A + 2B = 1 \\ A + B = 0 \end{cases} \Rightarrow \begin{cases} A = -1 \\ B = 1 \end{cases}$$

$$\begin{array}{r} 2x^2 + 3x + 1 \\ 2x \quad + \quad 1 \\ 1x \quad + \quad 1 \end{array}$$

$$X(z) = -\frac{1}{1+2z^{-1}} + \frac{1}{1+z^{-1}}$$

$$= -2^k \cos k\pi + \cos k\pi$$

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Solution 2. #18 $a = -2$ $a = -1$

$$X(z) = -(-2)^k + (-1)^k$$