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SIGNAL AND SYSTEMS

ASSIGNMENT 4

Question

Compute the convolution process between signal $x_1(t)$ and $x_2(t)$ by using Z-transform. Signal $x_1(t)$ and $x_2(t)$ are as follows

$x_1(t) =$ last four digit of your IC number

$x_2(t) =$ first six digit of your IC number

Solution:

$$x_1(t) = \{ 1, 4, 0, 7 \}$$

$$x_2(t) = \{ 0, 0, 0, 2, 1, 7 \}$$

↓

$$X_1(z) = 1 + 4z^{-1} + 0z^{-2} + 7z^{-3}$$

$$X_2(z) = 2z^{-3} + z^{-4} + 7z^{-5}$$

Therefore,

$$X(z) = X_1(z) \cdot X_2(z)$$

$$= (1 + 4z^{-1} + 0z^{-2} + 7z^{-3})(2z^{-3} + z^{-4} + 7z^{-5})$$

$$= (2z^{-3} + z^{-4} + 7z^{-5})(1 + 4z^{-1} + 0z^{-2} + 7z^{-3})$$

$$= 2z^{-3} + 8z^{-4} + 16z^{-5} + 14z^{-6}$$

$$+ 2z^{-4} + 4z^{-5} + 0z^{-6} + 7z^{-7}$$

$$+ 7z^{-5} + 28z^{-6} + 56z^{-7} + 49z^{-8}$$

$$X(z) = 2z^{-3} + 9z^{-4} + 27z^{-5} + 50z^{-6} + 63z^{-7} + 49z^{-8}$$

$$x(n) = \{ 0, 0, 0, 2, 9, 27, 50, 63, 49 \}$$

