

Quiz - 2

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Download latex-tikz codes from

https://github.com/KBVijayVarma/EE3900/tree/main/Quiz_2

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PROBLEM Q 3.5

Determine the sequence $x[n]$ with z-transform

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

SOLUTION

Given

$$X(z) = (1 + 2z)(1 + 3z^{-1})(1 - z^{-1}) \quad (0.0.1)$$

Given $X(z)$ is a Rational Function, its pole is only at $z = -1/2$.

By multiplying the factors of (0.0.1), $X(z)$ can be expressed as,

$$X(z) = (1 + 2z)(1 + 3z^{-1})(1 - z^{-1}) \quad (0.0.2)$$

$$X(z) = (1 + 2z)(1 + 2z^{-1} - 3z^{-2}) \quad (0.0.3)$$

$$X(z) = 2z + 5 - 4z^{-1} - 3z^{-2} \quad (0.0.4)$$

Therefore, by inspection, $x[n]$ is seen to be,

$$x[n] = \begin{cases} 2, & n = -1 \\ 5, & n = 0 \\ -4, & n = 1 \\ -3, & n = 2 \\ 0, & \text{otherwise} \end{cases} \quad (0.0.5)$$

Replacing z with $\delta[n+1]$ (using inverse z transform), $x[n]$ can be expressed as,

$$x[n] = 2\delta[n+1] + 5\delta[n] - 4\delta[n-1] - 3\delta[n-2] \quad (0.0.6)$$

The result $x[n]$ can be verified from below figure.

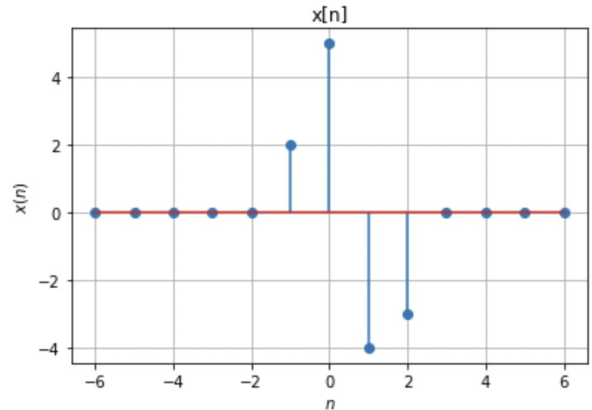


Fig. 0: $x[n]$