Digital Signal Processing

Oppenheim Assignments

J Sai Sri Hari Vamshi
AI21BTECH11014

Contents

1 The z-Transform

1.1 Determine the sequence $x[n]$ with z-tranform

$$X(z) = (1 + 2z)(1 + 3z^{-1})(1 - z^{-1}) \tag{1.1}$$

Solution: From the given equation,

$$\begin{aligned} X(z) &= (1 + 2z)(1 + 3z^{-1})(1 - z^{-1}) \\ &= (7 + 3z^{-1} + 2z)(1 - z^{-1}) \\ &= -3z^{-2} - 4z^{-1} + 5z^{0} + 2z^{1} \end{aligned}$$

We know,

$$X(z) = \sum_{n=-\infty}^{\infty} x[n]z^{n} \tag{1.2}$$

By Comparing the coefficients,

$$x[n] = \begin{cases} -3 & n = -2 \\ -4 & n = -1 \\ 5 & n = 0 \\ 2 & n = 1 \\ 0 & otherwise \end{cases} \tag{1.3}$$