Signal

Antalene (EE22BTECH11008)

For a given AP signal

$$x(n) = [x(0) + nd]\, u(n) \tag{1}$$

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n} \tag{2}$$

$$= \sum_{n=-\infty}^{\infty} [x(0) + nd]\, u(n)z^{-n} \tag{3}$$

$$= x(0) \sum_{n=-\infty}^{\infty} u(n)z^{-n} + d \sum_{n=-\infty}^{\infty} nu(n)z^{-n} \tag{4}$$

Let us consider $y(n) = u(n)$ $\tag{5}$

$$Y(z) = \sum_{n=-\infty}^{\infty} u(n)z^{-n} = \frac{1}{1 - z^{-1}} \tag{6}$$

$$\frac{dY(z)}{dz} = \frac{-1}{z} \sum_{n=-\infty}^{\infty} nu(n)z^{-n} \tag{7}$$

$$z^{-1} \frac{1}{(1 - z^{-1})^2} = \sum_{n=-\infty}^{\infty} nu(n)z^{-n} \tag{8}$$

Hence, For $\{z : |z| > 1\}$ $\qquad$ $$X(z) = \frac{x(0)}{1 - z^{-1}} + \frac{dz^{-1}}{(1 - z^{-1})^2} \tag{9}$$