UNIT 5 Z - Transforms and Difference equations
Z - Transforms

Z-transform

Definition : [Two sided (or) bilateral]

Let $\{f(n)\}$ be a sequence defined for all integers then its z-transform is defined to be

$$F(z) = Z\{f(n)\} = \sum_{n=-\infty}^{\infty} f(n) z^{-n}$$

where z is an arbitrary complex number.

Definition : [one-sided (or) unilateral]

Let $\{f(n)\}$ be a sequence defined for all positive integers then the z-transform of $\{f(n)\}$ is defined to be

$$F(z) = Z\{f(n)\} = \sum_{n=0}^{\infty} f(n) z^{-n}$$

Definition : Z-transform for discrete values of t.

If $f(t)$ is a function defined for discrete values of t, where $t = nT$, $n = 0, 1, 2, \ldots$ T being the sampling period, then z-transform of $f(t)$ is defined as

$$F(z) = Z\{f(t)\} = \sum_{n=0}^{\infty} f(nT) z^{-n}.$$

Note!

1. If $f(n)$ given then replace 'n' by 'n'.
2. If $f(t)$ given then replace 't' by nT