PROPERTIES OF ROC

PROPERTIES OF ROC : The z-Transform of a DT sequence $x[n]$ is

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

Region of Convergence (ROC): The range of values of `z` for which the summation (z-Transform) converges is called the ROC.

Properties of ROC :

(1) For a finite duration right-sided signal (causal signal), the ROC will be entire z-plane except $z=0$

(2) For a finite duration left-sided signal (anticausal signal), the ROC will be entire z-plane except $z=\infty$

(3) For a finite duration two sided signal, the ROC will be the entire z-plane except $z=0$ and $z=\infty$

(4) If $x[n]$ is right sided and of infinite duration (causal signal), then ROC is outside a circle whose radius is equal to the largest pole magnitude (Fig.1)

(5) If $x[n]$ is left sided and of infinite duration (anticausal signal), then ROC is inside a circle whose radius is equal to the smallest pole magnitude (Fig.2)

(6) If $x[n]$ is two sided and of infinite duration, then ROC will be a ring in the z-plane bounded by smallest & largest pole magnitudes (Fig3)

Fig.1   Fig.2   Fig.3