Assignment 1

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Question: Without explicity solving for $X(z)$,find the region of convergence of the z-transform of the following sequence.

(i)

$$x(n) = \begin{cases} 1 & -10 \le n \le 10 \\ 0 & \text{otherwise} \end{cases}$$

Solution:

$$Z(x(n)) = \sum_{n=-\infty}^{\infty} x(n) z^{-n} \tag{1}$$

$$= \sum_{n=-10}^{10} (1) z^{-n} \tag{2}$$

$$= z^{10} + z^{9} \cdots z^{-9} + z^{-10} \tag{3}$$

As,the z-transform of $x(n)$ is of finite length. it has postive and negative power at z in its $X(z)$.
Therefore, The ROC is

$$0 \le |z| \le \infty$$