GATE MA-28(2022)

EE:1205-Signals and Systems
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Question

The radius of convergence of the series

$$\sum_{n=0}^{\infty} 3^{n+1} z^{2n}, \quad z \in \mathbb{C}$$

is ?

(GATE MA-28 (2022))

Solution:

Parameter	Description	Value
$x(n)$	General Term	$3^{n+1}z^{2n}$
$Y(z)$	Given Sum	$\sum_{n=0}^{\infty} 3^{n+1}z^{2n}, \quad z \in \mathbb{C}$

TABLE 1: GATE MA-28(2022)

$$x(n) = 3^{n+1}z^{2n} = 3(3^n z^{2n}) \tag{1}$$

$$Y(z) = 3\sum_{n=0}^{\infty} 3^n z^{2n}, \quad z \in \mathbb{C} \tag{2}$$

$$= 3\sum_{n=0}^{\infty} (3z^2)^n \tag{3}$$

$$\tag{4}$$

For Radius of Convergence,

$$|3z^2| < 1 \tag{5}$$

$$|z| < \frac{1}{\sqrt{3}} \tag{6}$$

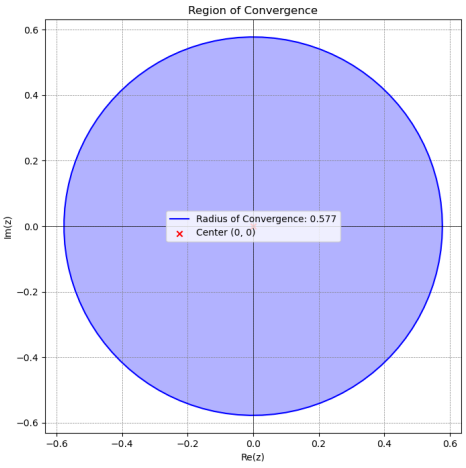

Fig. 1: ROC - $|z| < \frac{1}{\sqrt{3}}$