DISCRETE 11.9.3 Q-4

EE23BTECH11066 - Yakkala Amarnath Karthik

Question:

The 4^{th} term of a G.P. is square of its second term, and the first term is -3. Determine its 7^{th} term, and find the Z transform of the series.

Solution:

Variable	Description	value
$x(0)$	first term of G.P.	-3
r	Common ratio of G.P.	-3
$x(n)$	general term of the G.P.	ar^n
x(3)	fourth term	$x\left(1\right)^2$
u(n)	unit step function	-

TABLE I
A Table with input parameters

$$x\left(0\right)r^3 = \left(x\left(0\right)r^1\right)^2 \tag{1}$$

$$\implies x\left(0\right)r^3 = x\left(0\right)^2 r^2 \tag{2}$$

$$\implies r = x\left(0\right) \tag{3}$$

$$\implies r = -3 \tag{4}$$

general term

$$x\left(n\right) = x\left(0\right)r^n \tag{5}$$

$$= \left(-3\right)\left(-3\right)^n u\left(n\right) \tag{6}$$

The 7^{th} term of the sequence will be:

$$x\left(6\right) = \left(-3\right)\left(-3\right)^6 \tag{7}$$

$$= -2187 \tag{8}$$

Z transform of the given G.P is: $X(z) = \frac{a}{1-rz^{-1}} = \frac{-3}{1+3z^{-1}}.$ $\{ROC : |rz^{-1}| < 1\}$

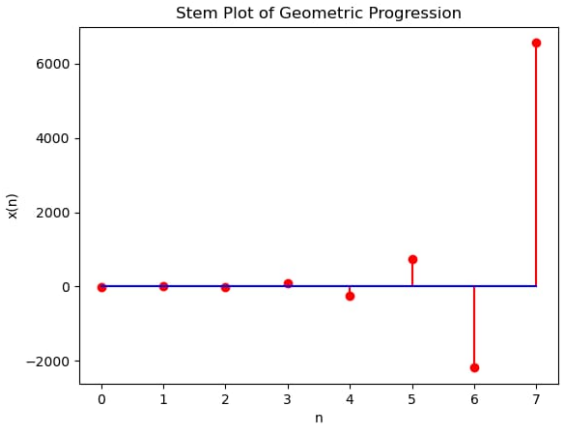

Fig. 1. Graph showing first 8 terms of the GP