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:

$$x(0)r^3 = (x(0)r^1)^2 = x(0)^2r^2 \tag{1}$$
$$r = x(0) = -3 \tag{2}$$
$$(x\,(6)) = x(0)r^6 \tag{3}$$
$$x\,(6) = (-3)\,(-3)^6 = (-3)^7 \tag{4}$$
$$x(6) = -2187 \tag{5}$$

Finding Z transform :

$$X\,(z) = \sum_{n=-\infty}^{\infty} x\,(n)\,z^{-n} \tag{6}$$
$$= \sum_{n=-\infty}^{\infty} ar^n u\,(n)\,z^{-n} \tag{7}$$
$$= \sum_{n=0}^{\infty} ar^n z^{-n} \tag{8}$$
$$= a(1 + rz^{-1} + r^2z^{-2} + ...) \tag{9}$$
$$= \frac{a}{1 - rz^{-1}} \tag{10}$$
$$\{ROC : |rz^{-1}| < 1\}$$

$X(n) = \frac{a}{1-rz^{-1}} = \frac{-3}{1+3z^{-1}}$.

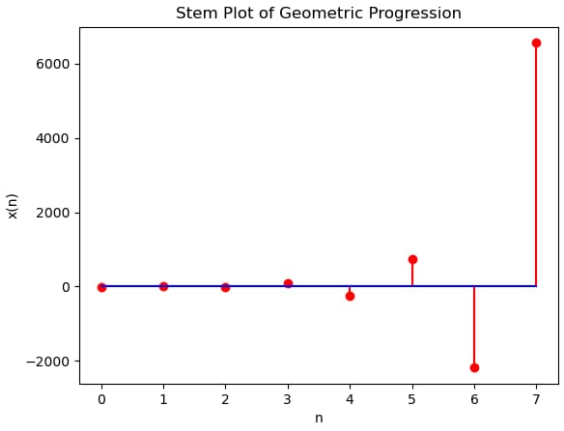

Fig. 1. Graph showing first 8 terms of the GP

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
-	$x(3)=(x(1))^2$	-

TABLE I
A Table with input parameters