Assignment

EE23BTECH11001 - Aashna Sahu

Q:Find a GP for which sum of the first two terms is -4 and the fifth term is 4 times the third term.
Solution: Let the GP be $a_0, a_0r, a_0r^2, a_0r^3, ...a_0r^n$

$$x(n) = x(0)r^n$$

Variable	Description
$x(0)$	First term of AP
r	Common ratio
$x(n)$	General term of given AP

TABLE 0: Input Parameters

S.no.	Given
1	x(0)+x(1)=-4
2	x(4)=4x(2)

TABLE 0: Given Information

$$x(0)r^4 = 4x(0)r^2 \tag{1}$$
$$r = +2, -2 \tag{2}$$

Substituting value of r in $x(0) + x(0)r = 4$

For $r = +2$
$x(0) = \frac{-4}{3}$

$x(n) = \frac{-4}{3} \times (2^n)$

GP: $\frac{-4}{3}, \frac{-8}{3}, \frac{-16}{3}$,....

For $r = -2$
$x(0) = 4$

$x(n) = 4 \times (-2)^n$

GP:$4, -8, 16, -32, ...$

General term can also be written as

$$\boxed{x(n) = x(0) \times r^n u(n)} \tag{3}$$

$$X(z) = \frac{x(0)}{1 - rz^{-1}} \quad \text{ROC:}|z| > |r| \tag{4}$$

$$X(z) = \begin{cases} \dfrac{4}{3(2z^{-1} - 1)}, & r = +2 \\ \dfrac{4}{1 + 2z^{-1}}, & r = -2 \end{cases} \tag{5}$$

ROC: $z \in (-\infty, -2) \cup (2, \infty)$

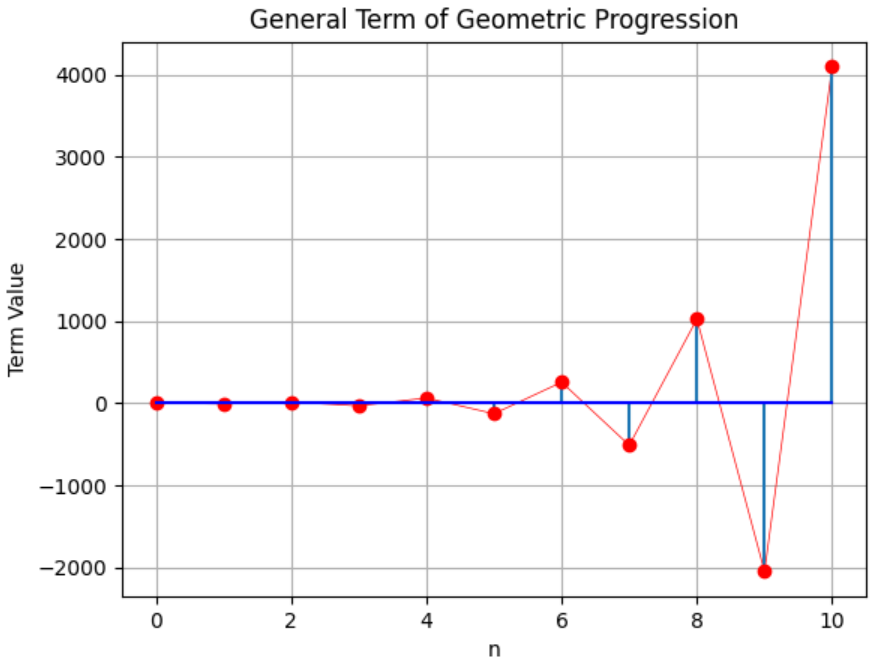

Fig. 0: Representation of x(n) in GP_2

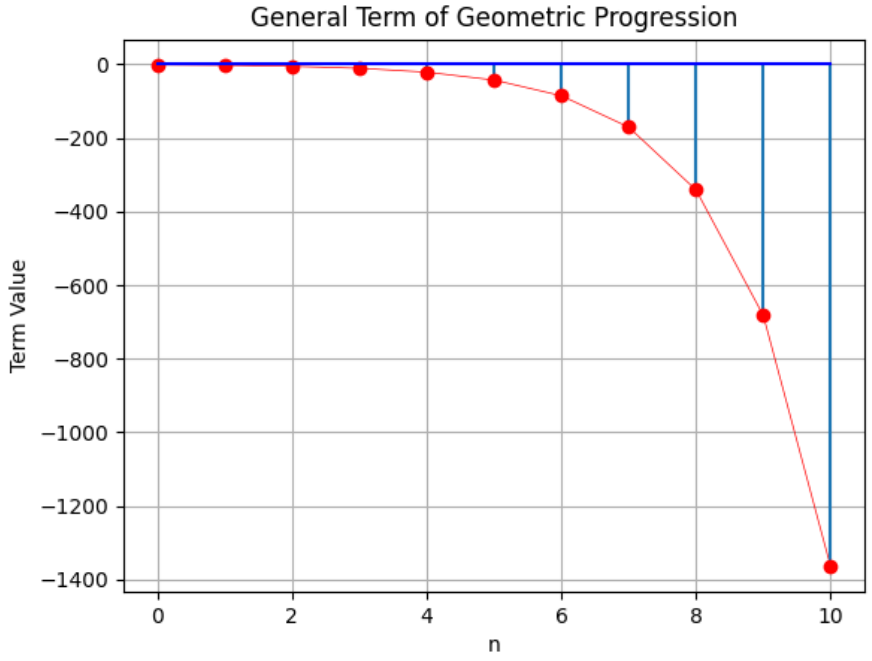

Fig. 0: Representation of x(n) in GP_1