

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:

Parameter	Description	Value
$x(0)$	First term of AP	–
r	Common ratio	–
$x(n)$	General term of given AP	–
$x(0) + x(1)$	sum of 1st and 2nd term	-4
$\frac{x(4)}{x(2)}$	Ratio of 5th and 3rd term	4
$y(n)$	Sum of first n+1 terms	$x(0)\left(\frac{r^{n+1}-1}{r-1}\right)u(n)$

TABLE 0: Input Parameters

$$x(n) = x(0) \times r^n u(n) \quad (1)$$

$$x(0)r^4 = 4x(0)r^2 \quad (2)$$

$$\Rightarrow r = +2, -2 \quad (3)$$

From Table 0 and (3) :

$$y(1) = x(0) \left(\frac{r^2 - 1}{r - 1} \right) u(1) \quad (4)$$

$$-4 = x(0)(r + 1) \quad (5)$$

$$\Rightarrow x(0) = \frac{-4}{r + 1} \quad (6)$$

$$x(0) = \begin{cases} \frac{-4}{3}, & r = +2 \\ 4, & r = -2 \end{cases} \quad (7)$$

$$X(z) = \frac{x(0)}{1 - rz^{-1}}, \quad |z| > |r| \quad (8)$$

$$X(z) = \begin{cases} \frac{4}{3(2z^{-1} - 1)}, & r = +2 \\ \frac{4}{1 + 2z^{-1}}, & r = -2 \end{cases} \quad (9)$$

$$|z| > 2$$

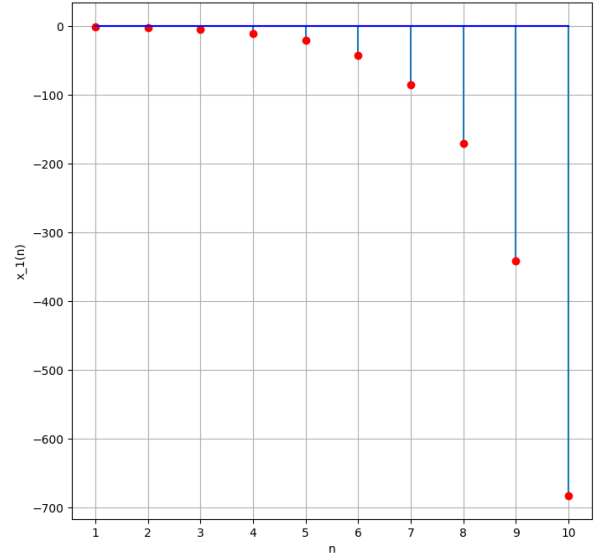


Fig. 0: Representation of $x(n)$ in GP_2

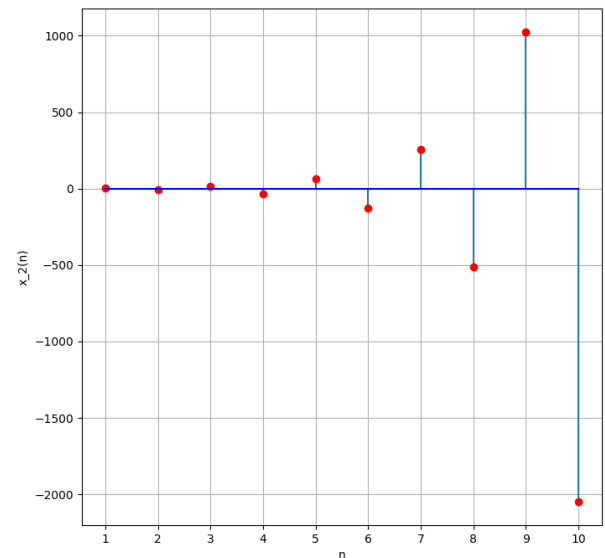


Fig. 0: Representation of $x(n)$ in GP_1