

NCERT 11.9.2.3

EE23BTECH11043 - BHUVANESH SUNIL NEHETE*

QUESTION

In an A.P. the first term is 2 and the sum of the first five terms is one-fourth of the next five terms. Show that 20th term is -112.

SOLUTION

Parameter	Value/Formula	description
$x(0)$	2	First term
$x(19)$	-112	20 th term
$x(n)$	$(x(0) + nd)u(n)$	$(n + 1)^{\text{th}}$ term of AP
d	-6	common difference

TABLE 0
INPUT DATA

General term can be written as

$$x(n) = (x(0) + nd)u(n) \quad (1)$$

The corresponding Z-transform can be written as

$$X(z) = \frac{x(0)}{1 - z^{-1}} + \frac{dz^{-1}}{(1 - z^{-1})^2} \quad (2)$$

Given,

$$\sum_{n=0}^4 x(n) = \frac{1}{4} \sum_{n=5}^9 x(n) \quad (3)$$

Simplifying:

$$5x(0) + 10d = \frac{1}{4}(5x(0) + 35d) \quad (4)$$

$$\Rightarrow x(0) = \frac{-d}{3} \quad (5)$$

$$\Rightarrow d = -6 \quad (6)$$

From (6) and Table 0

$$x(19) = x(0) + 19d \quad (7)$$

$$= 2 + 19(-6) \quad (8)$$

$$= -112 \quad (9)$$

From (6) and Table 0:

$$\Rightarrow x(n) = (2 - 6n)u(n) \quad (10)$$

From (2) and (10) :

$$X(z) = \frac{2}{1 - z^{-1}} - \frac{6z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (11)$$

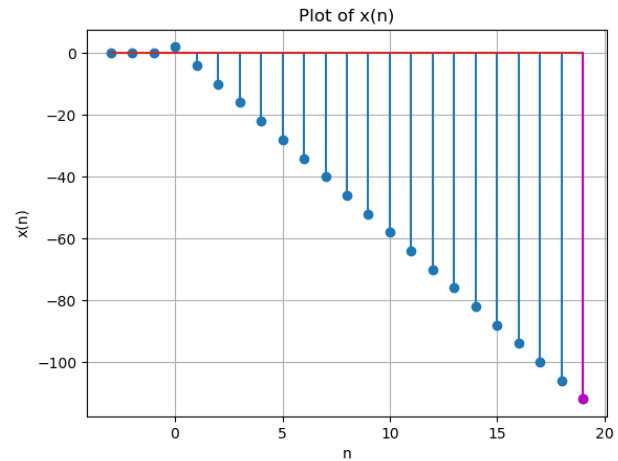


Fig. 1. graph of $x(n) = 2 - 6n$