

NCERT Discrete - 10.5.2.2

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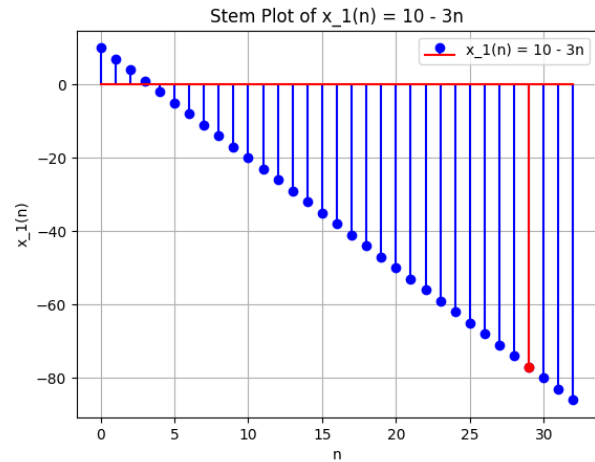
Question 10.5.2.2:

- 1) 30th term of the AP: 10, 7, 4, ... is
- 2) 11th term of the AP: $-3, -\frac{1}{2}, 2, \dots$ is

Solution:

Parameter	value	Description
$x_i(0)$	10	First term
	-3	
d_i	-3	Common difference
	$\frac{5}{2}$	
$x_1(29)$?	30th term
$x_2(10)$?	11th term

TABLE 2
INPUT PARAMETERS



The $(n + 1)th$ term of the AP is given by:

$$x_i(n) = [x_i(0) + (n) \times d_i] \times u(n) \quad (1)$$

1) Let the AP be a function $x_1(n)$ where $x_1(n)$ is the $(n + 1)th$ term of AP(1).

Let the common difference be d_1 .

So, the first term is $x_1(1 - 1)$ which is $x_1(0)$

For the 30th term of the series we need to find $x_1(30 - 1)$ which is $x_1(29)$.

Let Z-transform of $x_1(n)$ be $X_1(z)$.

where $u(n)$ is the step function.

From the equation (1) and the values from the table Table 2 :

$$x_1(29) = (10 + (29)(-3))(u(n)) \quad (2)$$

$$= (10 + 29(-3))(u(n)) \quad (3)$$

$$= (10 + (-87))(u(n)) \quad (4)$$

$$= -77 \quad (5)$$

(where $u(n) = 1$ if $n \geq 0$)

The Z-transform for the AP is :

$$X_1(z) = \frac{10 - 13z^{-1}}{(1 - z^{-1})^2} \quad \forall \quad |z| > 1 \quad (6)$$

So, the 30th term of the AP is -77 .

2) Let the AP be a function $x_2(n)$ where $x_2(n)$ is the $(n + 1)th$ term of AP(2).

Let the common difference be d_2 .

So, the first term is $x_2(1 - 1)$ which is $x_2(0)$

For the 11th term of the series we need to find $x_2(11 - 1)$ which is $x_2(10)$.

Let Z-transform of $x_2(n)$ be $X_2(z)$.

where $u(n)$ is the step function.

From the equation (1) and the values from the table Table 2 :

$$x_2(10) = (-3 + (10)\left(\frac{5}{2}\right))(u(n)) \quad (7)$$

$$= (-3 + 10(2.5))(u(n)) \quad (8)$$

$$= (-3 + 25)(u(n)) \quad (9)$$

$$= 22 \quad (10)$$

(where $u(n) = 1$ if $n \geq 0$)

The Z-transform for the AP is :

$$X_2(z) = \frac{0.5z^{-1} - 3}{(1 - z^{-1})^2} \quad \forall \quad |z| > 1 \quad (11)$$

so, the 11th term of the AP is 22.

