1

NCERT Discrete - 10.5.2.2

EE23BTECH11058 - Sindam Ananya*

Question 10.5.2.2:

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

Solution:

Parameter	value	Description
$x_i(0)$	10	First
	-3	term
d_i	-3	Common
	<u>5</u>	difference
$x_1(29)$?	30th term
$x_2(10)$?	11th term
TABLE 2		

INPUT PARAMETERS

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

$$x_i(n) = [x_i(0) + (n) \times d_i] \times u(n) \tag{1}$$

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:

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

$$= (10 + 29(-3))(u(n)) \tag{3}$$

$$= (10 + (-87))(u(n)) \tag{4}$$

$$= -77 \tag{5}$$

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

The Z-transform for the AP is:

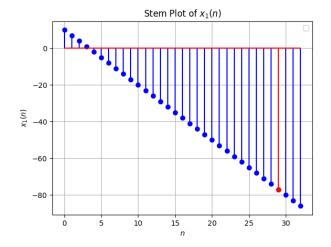
$$X_1(z) = \frac{10 - 13z^{-1}}{(1 - z^{-1})^2} \quad \forall \quad |z| > 1$$
 (6)

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:

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

$$= (-3 + 10(2.5))(u(n)) \tag{8}$$

$$= (-3 + 25)(u(n)) \tag{9}$$

$$= 22 \tag{10}$$

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

The Z-transform for the AP is:

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

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

