Assignment

EE23BTECH11001 - Aashna Sahu

Q:Check whether -150 is a term of the AP: 11,8,5,2,....

Solution: Let nth term of given AP be $x(n)$

Given:

First term,$a_0 = 11$ and Common difference,$d = -3$

$$x(n) = a_0 + nd$$
$$x(n) = 11 + n(-3)$$
$$x(n) = 11 - 3n$$

Now, we need to check if -150 is a term of the given AP.

$$-150 = 11 - 3n$$
$$3n = 161$$
$$n = 161/3$$

Here $n \notin N$

Thus -150 is not a term of the given AP.

$$\boxed{x(n) = (11 - 3n) \times u(n)} \tag{1}$$

The expression for u(n) is

$$u(n) = \begin{cases} 1 & \text{if } n \geq 0, \\ 0 & \text{if } n < 0. \end{cases}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (11 - 3n) z^{-n} u(n)$$
$$X(z) = \sum_{n=-\infty}^{0} (11 - 3n) \times 0 + \sum_{n=0}^{\infty} (11 z^{-n} - 3n z^{-n}) \times 1$$
$$X(z) = 11(z^0 + z^{-1} + z^{-2} + ...) - 3(0 + z^{-1} + 2z^{-2} + 3z^{-3} + ...)$$
$$X(z) = 11\left(\frac{1 - z^{-n}}{1 - z^{-1}}\right) - 3\left(\frac{z^{-1}(1 - z^{-n})}{(1 - z^{-1})^2}\right)$$
$$X(z) = 11u(z) - 3\left(-z\frac{d(u(z))}{dz}\right)$$

$$\boxed{X(z) = 11u(z) + 3z\frac{d(u(z))}{dz}} \tag{2}$$

Variable	Description	Value
a_0	First term of AP	11
d	Common difference	-3
$x(n)$	General term of given AP	None
n	Describing the order of term	None
$u(n)$	Unit Step Functions	Mentioned above
$u(z)$	Z-transform of u(n)	$\sum_{n=0}^{n=\infty} z^{-n}$
$X(z)$	Z-transform of x(n)	None

TABLE 0
INPUT PARAMETERS