

NCERT 11.9.2 Q7

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Question: Find the sum of n terms of the A.P. whose k th term is $5k + 1$.

Symbol	Value	Parameter
$x(0)$	1	First Term
$x(n)$	$(5n + 1)u(n)$	k th Term
d	5	Common Difference

TABLE I
GIVEN PARAMETERS

Apply the Z-transform to $x(n)$:

$$X(z) = \frac{5z^{-1}}{(1 - z^{-1})^2} + \frac{1}{(1 - z^{-1})} \quad |z| > 1 \quad (1)$$

Sum of First n Terms:

$$y(n) = x(n) * u(n) \quad (2)$$

Applying Z transform on both sides:

$$Y(z) = X(z) U(z) \quad (3)$$

$$= \frac{1}{(1 - z^{-1})^2} + \frac{5}{2} \cdot \frac{2z^{-1}}{(1 - z^{-1})^3} \quad (4)$$

Now we can compare the above pairs as;

$$nu(n) \xleftrightarrow{Z} \frac{z^{-1}}{(1 - z^{-1})^2} \quad (5)$$

$$u(n) \xleftrightarrow{Z} \frac{1}{(1 - z^{-1})} \quad (6)$$

$$n(n - 1)u(n) \xleftrightarrow{Z} \frac{2z^{-1}}{(1 - z^{-1})^3} \quad (7)$$

On referring the above equations and comparing, we can obtain the Z transform inverse as follows:

$$y(n) = (n + 1)u(n) + \frac{5}{2}n(n - 1)u(n) \quad (8)$$

Therefore we have got the sum of n terms as:

$$y(n) = \left(n + 1 + \frac{5}{2}n(n - 1) \right) u(n) \quad (9)$$

The stem plot is given as

