10.5.2.7

EE23BTECH11017 - Eachempati Mihir Divyansh*

Question: Find the 31st term of an AP whose 11th term is 38 and the 16th term is 73.

Solution:

Symbol	Value	Description
$x(0)$	-32	First term
$x(10)$	38	11th term
$x(15)$	73	16th term
d	7	Common Difference
$x(n)$	$x(0)+nd$	$(n+1)$th term

TABLE 0
GIVEN VALUES

From Table 0

$$x(0) + 10d = 38 \tag{1}$$
$$x(0) + 15d = 73 \tag{2}$$

From equations 1 and 2, the augmented matrix is:

$$\begin{pmatrix} 1 & 10 & 38 \\ 1 & 15 & 73 \end{pmatrix} \xleftrightarrow{R_2 \to R_2 - R_1} \begin{pmatrix} 1 & 10 & 38 \\ 0 & 5 & 35 \end{pmatrix} \tag{3}$$
$$\xleftrightarrow{R_1 \to R_1 - 2R_2} \begin{pmatrix} 1 & 0 & -32 \\ 0 & 5 & 35 \end{pmatrix} \tag{4}$$
$$\xleftrightarrow{R_2 \to \frac{R_2}{5}} \begin{pmatrix} 1 & 0 & -32 \\ 0 & 1 & 7 \end{pmatrix} \tag{5}$$
$$\implies \begin{pmatrix} x(0) \\ d \end{pmatrix} = \begin{pmatrix} -32 \\ 7 \end{pmatrix} \tag{6}$$

The general term and the Z-transform are given by

$$x(n) = (-32 + 7n)\, u(n) \tag{7}$$
$$\tag{8}$$

The 31st term of this A.P. is

$$x(30) = 178 \tag{9}$$

From (**??**), the Z-Transform of $x(n)$ is given by

$$X(z) = \frac{-32}{1 - z^{-1}} + \frac{7z^{-1}}{(1 - z^{-1})^2} \tag{10}$$

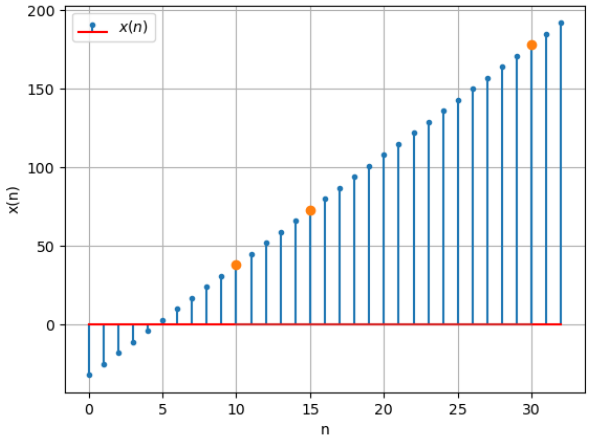

Fig. 0. Stem plot of $x(0)$ v/s n