

NCERT Discrete

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EE23BTECH11050

Question 10.5.2.8:

An AP consists of 50 terms of which 3rd term is 12 and the last term is 106. Find the 29th term.

Solution:

Z-transform :

$$\Rightarrow X(z) = \frac{8 - 6z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (12)$$

Parameter	Value	description
$x(2)$	12	Third term
$x(49)$	106	Last term
$x(0)$		First term
d		Common difference
$x(n)$	$(x(0) + nd)u(n)$	general term

TABLE I
INPUT PARAMETERS

$$\begin{pmatrix} x(2) \\ x(49) \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ 1 & 49 \end{pmatrix} \begin{pmatrix} x(0) \\ d \end{pmatrix} \quad (1)$$

$$\begin{pmatrix} 12 \\ 106 \end{pmatrix} = \begin{pmatrix} x(0) + 2d \\ x(0) + 49d \end{pmatrix} \quad (2)$$

converting to augmented matrix (3)

$$= \begin{pmatrix} x(0) + 2d & | & 12 \\ x(0) + 49d & | & 106 \end{pmatrix} \quad (4)$$

$$R_2 \rightarrow R_2 - R_1 \quad (5)$$

$$\xrightarrow{R_2 \rightarrow R_2 - R_1} \begin{pmatrix} x(0) + 2d & | & 12 \\ 47d & | & 94 \end{pmatrix} \quad (6)$$

From (6), we get

$$\Rightarrow x(0) = 8 \quad (7)$$

$$\Rightarrow d = 2 \quad (8)$$

From the Table I :

$$\Rightarrow x(n) = (8 + 2n)u(n) \quad (9)$$

Finding $x(28)$:

$$x(28) = x(0) + 28(2) \quad (10)$$

$$\Rightarrow x(28) = 64 \quad (11)$$

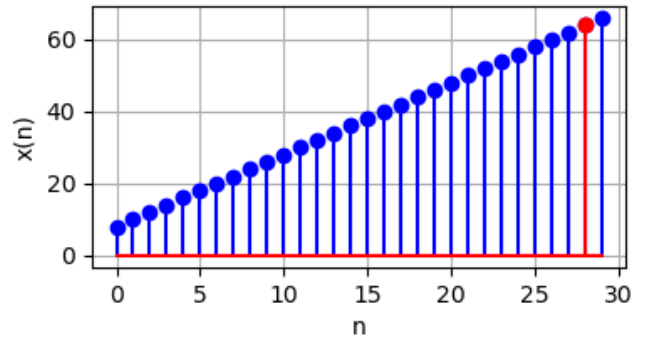


Fig. 1. graph of the given AP