NCERT Discrete

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EE23BTECH11050

Question 10.5.2.8:
An AP consists of 50 terms of which 3^{rd} term is 12 and the last term is 106. Find the 29^{th} term.
Solution:

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

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

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

$$R_2 \to R_2 - R_1 \tag{3}$$

$$\begin{pmatrix} 12 \\ 94 \end{pmatrix} = \begin{pmatrix} x(0)+2d \\ 47d \end{pmatrix} \tag{4}$$

1) By equating the both matrices, we get

$$12 = x(0) + 2d \tag{5}$$
$$94 = 47d \tag{6}$$

2) On solving (5) and (6), we get

$$\implies x(0) = 8 \tag{7}$$
$$\implies d = 2 \tag{8}$$

3) From the Table I :

$$x(n) = (x(0)+nd)u(n) \tag{9}$$
$$\implies x(n) = (8+2n)u(n) \tag{10}$$

4) Finding $x(28)$:

$$x(28) = x(0) + 28(2) \tag{11}$$
$$\implies x(28) = 64 \tag{12}$$

5) Z-transform :

$$\implies X(z) = \frac{8-6z^{-1}}{(1-z^{-1})^2} \quad |z| > 1 \tag{13}$$

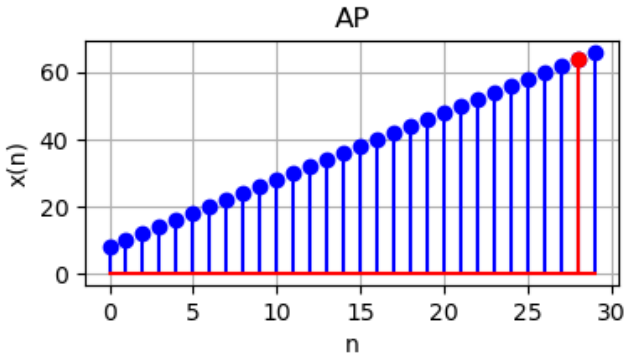

Fig. 1. graph of the given AP