NCERT DISCRETE

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Question 10.5.3.5: The first term of an AP is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.

solution:

Given AP is 5, …, 45.

$x(0)$	5	1st term
$x(n)$	45	$(n+1)$th term
$y(n)$	400	sum of $(n+1)$ terms
n+1	?	no.of terms
d	?	common difference

TABLE 0

PARAMETERS
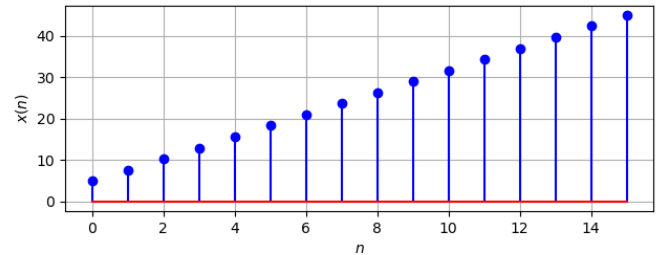
$$x(n) = x(0) + nd \tag{1}$$

$$40 = nd \tag{2}$$

$$y(n) = \frac{n+1}{2}[2x(0) + nd] \tag{3}$$

$$\implies n = 15 \tag{4}$$

$$\implies d = \frac{8}{3} \tag{5}$$

Fig. 0. analysis of x(n)

by substituting equation (4) in the equation (2), we get the equation (5).

z transform of $x(n), y(n)$ are $X(z), Y(z)$

$$X(z) = \frac{7}{3(1-z^{-1})} + \frac{8}{3(1-z^{-1})^2} \tag{6}$$
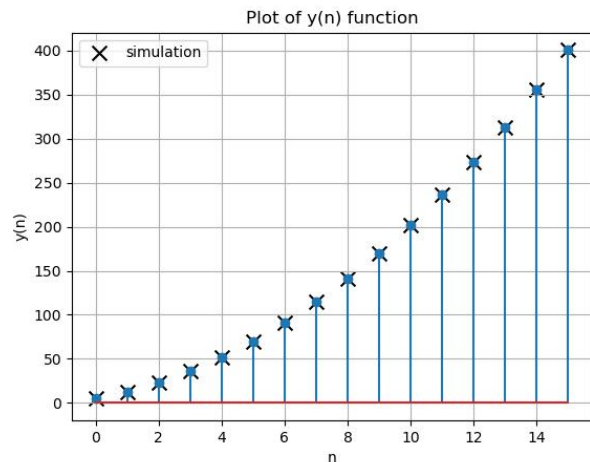
$$Y(z) = \frac{7}{3(1-z^{-1})^2} + \frac{8}{3(1-z^{-1})^3} \tag{7}$$

Fig. 0. simulation vs analysis of y(n)