10.05.2

EE23BTECH11053-R.Rahul*

QUESTION:

1. In the following APs, find the missing terms in the boxes:

(i) $2, \square, 26$

(ii) $\square, 13, \square, 3$

(iii) $5, \square, \square, 9\frac{1}{2}$

(iv) $'-4', \square, \square, \square, \square, 6$

(v) $\square, 38, \square, \square, \square, '-22'$

Solution:

n	$x_1(n)$	$x_2(n)$	$x_3(n)$	$x_4(n)$	$x_5(n)$
1	14	13	$6\frac{1}{2}$	-2	38
2	26	8	8	0	23
3	38	3	$9\frac{1}{2}$	2	8
4	50	-2	11	4	-7
5	62	-7	$12\frac{1}{2}$	6	-22

TABLE I
FIRST THREE TERMS OF AP SERIES

(i) a_1=2 ,a_3=26, a_3=$a + 2d$
$\implies 26 = 2 + 2d \implies$ 24=2d $\therefore$ d=12
$a_2 = 14$

(ii) $a_2 = 13, a_4 = 3, a_2 = a + d, a_4 = a + 3d$
$\implies 3 - 13 = 2d \implies$ -10=5d $\therefore$ d=-5
$a_1 = 18, a_3 = 8$

(iii)a_1=5, a_4=$9\frac{1}{2}$, $a_4 = a + 3d$
$\implies 9\frac{1}{2}$= 5 + $3d \implies 3d = 4\frac{1}{2}$ $\therefore$ d=$1\frac{1}{2}$
a_2=$6\frac{1}{2}$, a_3=8

(iv) a_1=-4 , a_6=6, a_6=a+5d
$\implies$ 6=-4+5d $\implies$10=5d $\therefore$ d=2
a_2=-2 a_3=0 a_4=2 a_5=4

(v) a_2=38 a_6=-22
$\implies$ -22-38=4d $\implies$ -60=4d $\therefore$ d=-15
a_1=53 a_3=23 a_4=8 a_5=-7

1) The Z-transform of $x(n) = 2 + 12n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n) \times z^{-n} \tag{1}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (2 + 12n)u(n) \times z^{-n} \tag{2}$$

$$X(z) = 2 \times \frac{1}{1 - z^{-1}} + 12 \times \frac{z^{-1}}{(1 - z^{-1})^2} \tag{3}$$

$$X(z) = \frac{2 + 10z^{-1}}{(1 - z^{-1})^2} \qquad |z| > 1 \tag{4}$$

$$\tag{5}$$

2) The Z-transform of $x(n) = 18 - 5n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n) \times z^{-n} \tag{6}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (18 - 5n)u(n) \times z^{-n} \tag{7}$$

$$X(z) = 18 \times \frac{1}{1 - z^{-}1} - 5 \times \frac{z^{-1}}{(1 - z^{-}1)^2} \tag{8}$$

$$X(z) = \frac{18 - 23z^{-1}}{(1 - z^{-1})^2} \qquad |z| > 1 \tag{9}$$

$$\tag{10}$$

3) Z-transform of $x(n) = 5 + \frac{3}{2}n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n) \times z^{-n} \tag{11}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (5 + \frac{3}{2}n)u(n) \times z^{-n} \tag{12}$$

$$X(z) = 5 \times \frac{1}{1 - z^{-1}} + \frac{3}{2} \times \frac{z^{-1}}{(1 - z^{-1})^2} \tag{13}$$

$$X(z) = \frac{5 - \frac{7}{2}z^{-1}}{(1 - z^{-1})^2} \qquad |z| > 1 \tag{14}$$

$$\tag{15}$$

4) Z-transform of $x(n) = -4 + 2n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n) \times z^{-n} \tag{16}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (-4 + 2n)u(n) \times z^{-n} \tag{17}$$

$$X(z) = -4 \times \frac{1}{1 - z^{-1}} + 2 \times \frac{z^{-1}}{(1 - z^{-1})^2} \tag{18}$$

$$X(z) = \frac{-4 + 6z^{-1}}{(1 - z^{-1})^2} \qquad |z| > 1 \tag{19}$$

$$\tag{20}$$

5) Z-transform of $x(n) = 53 - 15n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n) \times z^{-n} \tag{21}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (53 - 15n)u(n) \times z^{-n} \tag{22}$$

$$X(z) = 53 \times \frac{1}{1 - z^{-1}} - 15 \times \frac{z^{-1}}{(1 - z^{-1})^2} \tag{23}$$

$$X(z) = \frac{53 - 68z^{-1}}{(1 - z^{-1})^2} \qquad |z| > 1 \tag{24}$$

$$\tag{25}$$

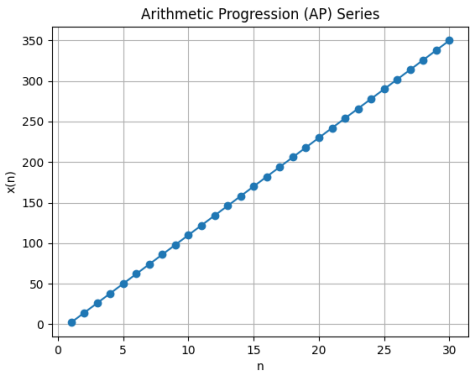

Fig. 1.

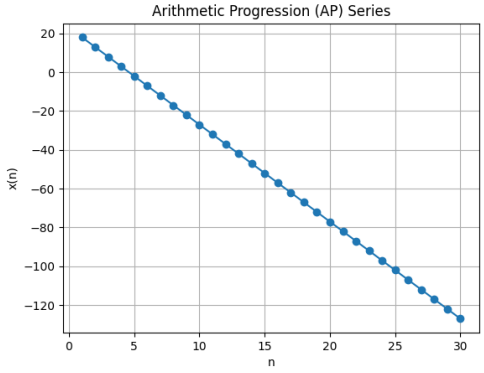

Fig. 2.

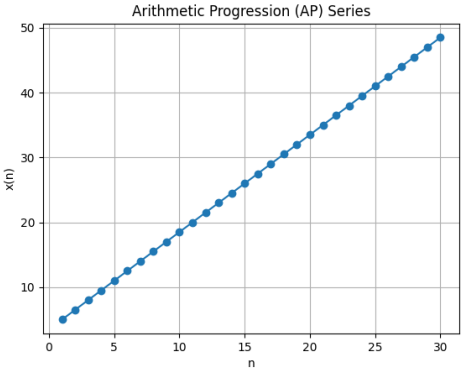

Fig. 3.

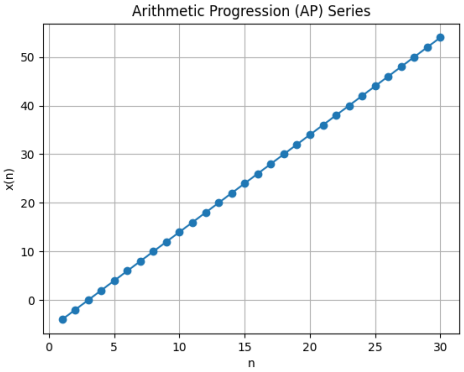

Fig. 4.

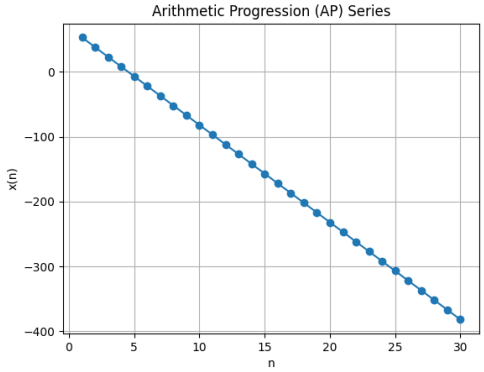

Fig. 5.