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	$x_1(n)$	$x_2(n)$	$x_3(n)$	$x_4(n)$	$x_5(n)$
0	2	18	5	-4	53
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) $x(0)=2$,$x(2)=26$, $x(2)=x(0)+2d$

$$26 = 2 + 2d \tag{1}$$
$$24 = 2d \tag{2}$$
$$\therefore d = 12 \tag{3}$$
$$x(1) = 14 \tag{4}$$

(ii) $x(1) = 13, x(3) = 3, x(1) = x(0) + d, x(4) = x(0) + 3d$

$$3 - 13 = 2d \tag{5}$$
$$-10 = 2d \tag{6}$$
$$\therefore d = -5 \tag{7}$$
$$x(1) = 18 \tag{8}$$
$$x(2) = 8 \tag{9}$$

(iii)$x(0)=5$, $x(3)=9\frac{1}{2}$, $x(3) = x(0) + 3d$

$$9\ \frac{1}{2} = 5 + 3d \tag{10}$$
$$3d = 4\frac{1}{2} \tag{11}$$
$$\therefore d = 1\ \frac{1}{2} \tag{12}$$
$$x(1) = 6\ \frac{1}{2} \tag{13}$$
$$x(2) = 8 \tag{14}$$

(iv) $x(0)=-4$, $x(5)=6$, $x(5)=$x(0)+5d

$$6 = -4 + 5d \tag{15}$$
$$10 = 5d \tag{16}$$
$$\therefore d = 2 \tag{17}$$
$$x(1) = -2 \tag{18}$$
$$x(2) = 0 \tag{19}$$
$$x(3) = 2 \tag{20}$$
$$x(4) = 4 \tag{21}$$

(v) $x(1)=38$ $x(5)=-22$

$$-22 - 38 = 4d \tag{22}$$
$$-60 = 4d \tag{23}$$
$$\therefore d = -15 \tag{24}$$
$$x(0) = 53 \tag{25}$$
$$x(2) = 23 \tag{26}$$
$$x(3) = 8 \tag{27}$$
$$x(4) = -7 \tag{28}$$
$$\tag{29}$$

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

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n)z^{-n} \tag{30}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (2 + 12n)u(n)z^{-n} \tag{31}$$

$$X(z) = 2\frac{1}{1 - z^{-1}} + 12\frac{z^{-1}}{(1 - z^{-1})^2} \tag{32}$$

$$X(z) = \frac{2 + 10z^{-1}}{(1 - z^{-1})^2} \qquad |z| > 1 \tag{33}$$

$$\tag{34}$$

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

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n)z^{-n} \tag{35}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (18 - 5n)u(n)z^{-n} \tag{36}$$

$$X(z) = 18 \times \frac{1}{1 - z^{-}1} - 5\frac{z^{-1}}{(1 - z^{-}1)^2} \tag{37}$$

$$X(z) = \frac{18 - 23z^{-1}}{(1 - z^{-1})^2} \qquad |z| > 1 \tag{38}$$

$$\tag{39}$$

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

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n)z^{-n} \tag{40}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (5 + \frac{3}{2}n)u(n)z^{-n} \tag{41}$$

$$X(z) = 5 \times \frac{1}{1 - z^{-1}} + \frac{3}{2}\frac{z^{-1}}{(1 - z^{-1})^2} \tag{42}$$

$$X(z) = \frac{5 - \frac{7}{2}z^{-1}}{(1 - z^{-1})^2} \qquad |z| > 1 \tag{43}$$

$$\tag{44}$$

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

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n)z^{-n} \tag{45}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (-4 + 2n)u(n)z^{-n} \tag{46}$$

$$X(z) = -4 \times \frac{1}{1 - z^{-1}} + 2\frac{z^{-1}}{(1 - z^{-1})^2} \tag{47}$$

$$X(z) = \frac{-4 + 6z^{-1}}{(1 - z^{-1})^2} \qquad |z| > 1 \tag{48}$$

$$\tag{49}$$

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

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n)z^{-n} \tag{50}$$

$$X(z) = \sum_{n=-\infty}^{\infty} (53 - 15n)u(n)z^{-n} \tag{51}$$

$$X(z) = 53 \times \frac{1}{1 - z^{-1}} - 15\frac{z^{-1}}{(1 - z^{-1})^2} \tag{52}$$

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

$$\tag{54}$$

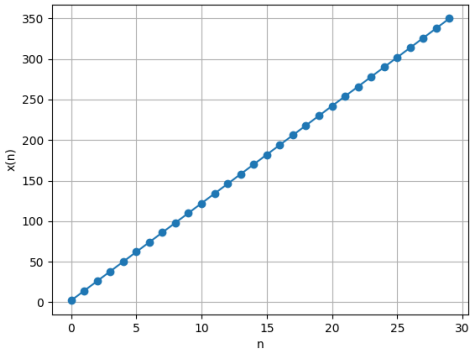

Fig. 1.

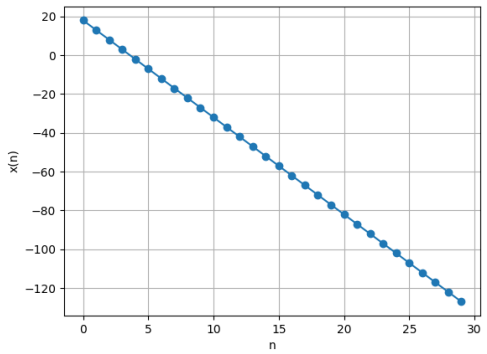

Fig. 2.

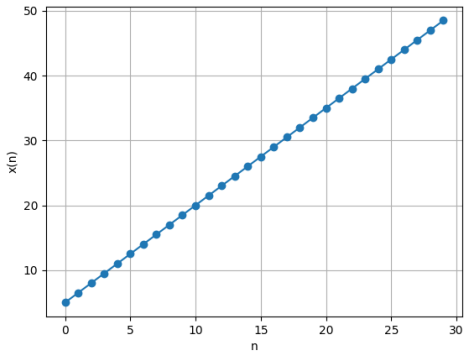

Fig. 3.

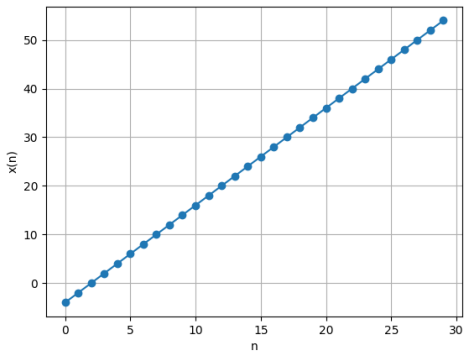

Fig. 4.

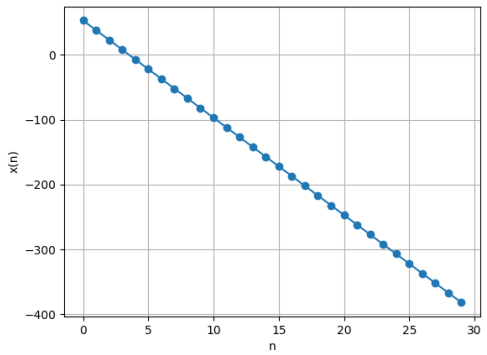

Fig. 5.