

Discrete Assignment

EE1205 Signals and Systems

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Question

If the sum of the first n terms of an AP is $4n - n^2$, what is the first term (S_1)? What is the sum of the first two terms? What is the second term? Similarly, find the 3rd, the 10th, and the n th terms.

Solution:

| variable | value | description |
|----------|------------------|--------------------------------|
| y(n) | $(4n - n^2)u(n)$ | Sum of first n-terms |
| x(n) | - | n^{th} term of the AP |
| d | - | common difference of AP |

TABLE I

TABLE: INPUT PARAMETERS

$$y(n-1) = (4n - n^2)u(n) \quad (1)$$

refer equation(??) ,equation (??),equation (??) from appendix

$$z^{-1}Y(z) = 4 \left(\frac{z^{-1}}{(1 - z^{-1})^2} \right) - \frac{z^{-1}(1 + z^{-1})}{(1 - z^{-1})^3} \quad (2)$$

$$Y(z) = \frac{4}{(1 - z^{-1})^2} - \frac{(1 + z^{-1})}{(1 - z^{-1})^3} \quad (3)$$

$$Y(z) = X(z) U(z) \quad (4)$$

$$X(z) = \frac{Y(z)}{U(z)} \quad (5)$$

$$X(z) = 4 \left(\frac{1}{(1 - z^{-1})} \right) - \frac{(1 + z^{-1})}{(1 - z^{-1})^2} \quad (6)$$

$$= \frac{(3 - 5z^{-1})}{(1 - z^{-1})^2} \quad (7)$$

$$= \frac{3}{1 - z^{-1}} - \frac{2z^{-1}}{(1 - z^{-1})^2} \quad (8)$$

refer equation(??) from appendix

$$x(n) = 3u(n) - 2nu(n) \quad (9)$$

$$x(n) = (3 - 2n)u(n) \quad (10)$$

$$\text{First term of AP } x(0) = 3 \quad (11)$$

$$\text{sum of first two terms is } y(1) = 4(2) - (2)^2 \quad (12)$$

$$= 4 \quad (13)$$

$$\text{second term of AP } x(1) = 1 \quad (14)$$

$$\text{third term of AP } x(2) = -1 \quad (15)$$

$$\text{tenth term of AP } x(9) = -15 \quad (16)$$

$$n^{th} \text{ term of AP } x(n) = (3 - 2n)u(n) \quad (17)$$