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Question 11.9.3-19: Find the sum of the products of the corresponding terms of the sequences $2, 4, 8, 16, 32$ and $128, 32, 8, 2, \frac{1}{2}$.

Solution:

TABLE I: Input Parameters

Parameter	Value	Description
$x_1(n)$	$2, 4, 8, 16, 32$	Sequence 1
$x_2(n)$	$128, 32, 8, 2, \frac{1}{2}$	Sequence 2
$y(n)$	-	Sum of the Products

Define the sequences as follows:

$$\text{Sequence 1: } x_1(n) = 2(2)^n u(n) \tag{1}$$

$$\text{Sequence 2: } x_2(n) = 128 \left(\frac{1}{4}\right)^n u(n) \tag{2}$$

$$x(n) = x_1(n) x_2(n) \tag{3}$$

$$x(n) = \left(\frac{256}{2^n}\right) u(n) \tag{4}$$

Z-Transform: The Z-transform of a sequence $x(n)$ is:

$$X(z) = \frac{256}{1 - \frac{z^{-1}}{2}} \quad |z| > \frac{1}{2} \tag{5}$$

$$Let, y(n) = x(n) * u(n) \tag{6}$$

$$Y(z) = X(z)U(z) \tag{7}$$

$$= \left(\frac{256}{1 - \frac{z^{-1}}{2}}\right)\left(\frac{1}{1 - z^{-1}}\right) \tag{8}$$

$$= \frac{-256}{1 - \frac{z^{-1}}{2}} + \frac{512}{1 - z^{-1}} \tag{9}$$

Inverse of Z Transform of Y(z):

$$y(n) = \left[\frac{-256}{2^n} + \frac{512}{1}\right] u(n) \tag{10}$$

As, n = 4, sum = 496.
This gives us the sum of the products of corresponding terms, which is 496.

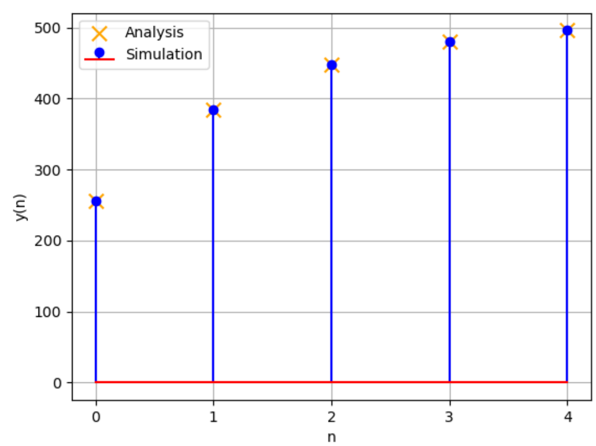

Fig. 1: Plot of $y(n)$ vs n