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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: Define the sequences as follows:

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

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

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

$$x(n) = x_1(n) \times x_2(n) = \frac{256}{2^n} \tag{3}$$

$$X(z) = \frac{512}{2 - z^{-1}} \tag{4}$$

$$\tag{5}$$

$$let, Y(z) = X(z) \times u(z) \tag{6}$$

$$= \left(\frac{512}{2 - z^{-1}}\right) \times \left(\frac{1}{1 - z^{-1}}\right) \tag{7}$$

$$= \frac{-256}{1 - \frac{z^{-1}}{2}} + \frac{512}{1 - z^{-1}} \tag{8}$$

$$\tag{9}$$

On taking inverse of Z Transform:

$$Y(n) = \frac{-256}{2^n} + \frac{512}{1} \tag{10}$$

$$\tag{11}$$

As, n = 4, sum = 496.

This gives us the sum of the products of corresponding terms, which is 496.