Discrete Assignment

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Question (11.9.3.14) The sum of first three terms of a G.P. is 16 and the sum of next three terms is 128. Determine the first term , the common ratio, and the sum to n terms of the G.P.

Answer

Parameter	Description	Value
$x(0)$	First term of AP	–
r	Common ratio	–
$x(n)$	General term of given AP	$x(0)r^n u(n)$
$x(0)+x(1)+x(2)$	sum of 1st,2nd and 3rd terms	16
$x(3)+x(4)+x(5)$	sum of 3rd,4th and 5th terms	128

Given:

$$a + ar + ar^2 = 16 \tag{1}$$

$$ar^3 + ar^4 + ar^5 = 128 \tag{2}$$

From Equation (1):

$$a(1 + r + r^2) = 16 \tag{3}$$

$$a = \frac{16}{1 + r + r^2} \tag{4}$$

$$ar^3 = \frac{128}{1 + r + r^2} \tag{5}$$

$$r^3 = 8 \tag{6}$$

$$r = 2 \tag{7}$$

$$a = \frac{16}{7} \tag{8}$$

Solving for r in terms of a:

$$S_n = \frac{a(1 - r^n)}{1 - r} \tag{9}$$

$$S_n = \frac{16}{7}(2^n - 1) \tag{10}$$

The Z-transform will be:

$$X(z) = \frac{\frac{16}{7}}{1 - 2z^{-1}} \tag{11}$$