Maths Assignment

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PROBLEM STATEMENT

A G.P consists of an even number of terms. If the sum of all terms is 5 times the sum of terms occupying odd places, then find its common ratio.

SOLUTION

Parameter	Description
n	Number of terms in the G.P
$x(0)$	first term in the G.P
r	common ratio in the G.P
$x(n)$	nth term in the G.P
$y(n)$	sum of G.P series
$w(n)$	sum of terms in odd places

TABLE I
INPUT PARAMETERS

Solving the Question in time domain:

$$n = 2m \tag{1}$$

$$x(n) = x(0)r^{2m} \tag{2}$$

$$y(n) = x(0)\left(\frac{r^{2m+1} - 1}{r - 1}\right)u(2m) \tag{3}$$

$$Y(z) = \frac{x(0)}{(1 - rz^{-1})(1 - z^{-1})} \tag{4}$$

The sum of terms in odd places:

$$w(n') = x(0)\left(\frac{r^{2(n'+1)} - 1}{r^2 - 1}\right)u(n') \tag{5}$$

$$n' = \frac{2m - 1}{2} \tag{6}$$

$$w(n) = x(0)\left(\frac{r^{2m+1} - 1}{r^2 - 1}\right)u(2m) \tag{7}$$

where $r \neq \pm 1$

$$W(z) = \frac{x(0)}{\left(1 - rz^{\frac{-1}{2}}\right)(1 - z^{-1})} \tag{8}$$

Then from (3) and (7)

$$x(0)\left(\frac{r^{2m+1} - 1}{r - 1}\right)u(2m) = 5x(0)\left(\frac{r^{2m+1} - 1}{r^2 - 1}\right)u(2m) \tag{9}$$

$$r^2 - 5r + 4 = 0 \tag{10}$$

$$r = 4 \tag{11}$$