

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
$y_o(n)$	sum of terms in odd places

Table 1: Input Parameters

Solving the Question in time domain:

$$x(n) = x(0)r^n \quad (1)$$

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

The sum of terms in odd places:

$$y_o(n') = x(0) \left(\frac{r^{2(n'+1)} - 1}{r^2 - 1} \right) u(n') \quad (3)$$

$$n' = \frac{n-1}{2} \quad (4)$$

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

Then from (2) and (5)

$$x(0)(\frac{r^{n+1}-1}{r-1})u(n) = 5x(0)(\frac{r^{n+1}-1}{r^2-1})u(n) \quad (6)$$

$$r^2 - 5r + 4 = 0 \quad (7)$$

$$r = 1 \quad \text{or} \quad (8)$$

$$r = 4 \quad (9)$$