

Discrete

EE1205 : Signals and Systems
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I. QUESTION 11.9.5 (18)

If a and b are the roots of $x^2 - 3x + p = 0$ and c, d are roots of $x^2 - 12x + q = 0$ where a, b, c, d form a G.P. Prove that $(q + p) : (q - p) = 17:15$.

On dividing eq. (5) and eq. (6), we get

$$\frac{ar^2(1+r)}{a(1+r)} = \frac{12}{3} \quad (7)$$

$$r^2 = 4 \quad (8)$$

$$r = \pm 2 \quad (9)$$

When $r = 2, a = 1$

When $r = -2, a = -3$

Case 1 : When $r = 2$ and $a = 1$

II. SOLUTION

Parameter	Value	Description
$x_1(n)$	-	G.P. Sequence
$x_1(0)$	a	First term of G.P.
$x_1(1)$	b	Second term of G.P.
$x_1(2)$	c	Third term of G.P.
$x_1(3)$	d	Fourth term of G.P.
r	$\frac{b}{a}$	Common ratio

TABLE I
GIVEN PARAMETERS

$$p = ab \quad (10)$$

$$p = 2 \quad (11)$$

$$q = cd \quad (12)$$

$$q = 32 \quad (13)$$

$$\frac{q+p}{q-p} = \frac{32+2}{32-2} \quad (14)$$

$$= \frac{17}{15} \quad (15)$$

Case 2 : When $r = -2$ and $a = -3$

$$p = ab \quad (16)$$

$$p = -18 \quad (17)$$

$$q = cd \quad (18)$$

$$q = 288 \quad (19)$$

$$\frac{q+p}{q-p} = \frac{288-18}{288+18} \quad (20)$$

$$= \frac{135}{153} \quad (21)$$

Hence, case 1 satisfies the condition.

Given $x_1(0)$ and $x_1(1)$ are the roots of $x^2 - 3x + p = 0$ So, we have :

$$a + b = 3 \quad (1)$$

$$ab = p \quad (2)$$

Also, $x_1(2)$ and $x_1(3)$ are the roots of $x^2 - 12x + q = 0$, so,

$$c + d = 12 \quad (3)$$

$$cd = q \quad (4)$$

From (1) and (3), we get,

$$a(1+r) = 3 \quad (5)$$

And,

$$ar^2(1+r) = 12 \quad (6)$$