EE23BTECH11047 - Deepakreddy P

17 If a, b, c, d are in G.P, prove that $(a^n + b^n), (b^n + c^n), (c^n + d^n)$ are in G.P

Solution:

TABLE I Input Parameters

Symbol	Input value
x(0)	а
x(1)	b
x(2)	c
x(3)	d
r	$\frac{b}{a}$

$$r = \frac{b}{a} = \frac{c}{b} = \frac{d}{c}$$

From eq(1)

$$= \frac{b^{n} + c^{n}}{a^{n} + b^{n}}$$

$$= \frac{(ar^{1})^{n} + (ar^{2})^{n}}{(ar^{0})^{n} + (ar^{1})^{n}}$$

$$= \frac{r^{n} ((ar^{1})^{n} + (ar^{2})^{n})}{r^{n} ((ar^{0})^{n} + (ar^{1})^{n})}$$

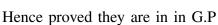
$$= \frac{(ar^{2})^{n} + (ar^{3})^{n}}{(ar^{1})^{n} + (ar^{2})^{n}}$$

$$= \frac{c^n + d^n}{b^n + c^n}$$

$$\Longrightarrow \frac{b^n + c^n}{a^n + b^n} = \frac{c^n + d^n}{b^n + c^n}$$

$$(6)$$

$$\implies \frac{x(1)^n + x(2)^n}{x(0)^n + x(1)^n} = \frac{x(2)^n + x(3)^n}{x(1)^n + x(2)^n}$$
(8)



$$x(n) = ar^n u(n) \tag{10}$$

(9)

$$X(z) = \frac{a}{1 - rz^{-1}}, \quad |z| > |r|$$
 (11)

