

NCERT Mathematics 10.5.2 Q10

EE23BTECH11213 - MUTHYALA NIKHITHA SRI

Question: The 17th term of an AP exceeds its 10th term by 7. Find the common difference.

Solution:

Parameter	Description	Value
$x(0)$	First term of AP	
d	Common difference of AP	
$x(16) - x(9)$	The difference between 17th and 10th term of AP	7

Using the formula for the n th term of an AP ($x(n) = x(0) + (n)d$), where $x(n)$ represents the $(n + 1)$ th term of an arithmetic progression (AP)

$$x(16) = x(0) + 16d \quad (1)$$

$$x(9) = x(0) + 9d \quad (2)$$

$$(x(0) + 16d) - (x(0) + 9d) = 7 \quad (3)$$

$$\implies 7d = 7 \quad (4)$$

$$\implies d = 1 \quad (5)$$

Now,

$$y(n) = x(n) \cdot u(n) = (x(0) + nd)u(n) \quad (6)$$

The z-transform of $y(n)$ is given by

$$Y(z) = x(0) \cdot \frac{1}{1 - z^{-1}} + d \cdot \frac{z^{-1}}{(1 - z^{-1})^2}; \quad |z| > 1 \quad (7)$$

$$\implies Y(z) = x(0) \cdot \frac{1}{1 - z^{-1}} + 1 \cdot \frac{z^{-1}}{(1 - z^{-1})^2} \quad (8)$$