

NCERT Discrete - 11.9.3.30

EE23BTECH11007 - Aneesh Kadiyala*

Question 11.9.3.30: The number of bacteria in a certain culture doubles every hour. If there were 30 bacteria present in the culture originally, how many bacteria will be present at the end of 2nd hour, 4th hour and n^{th} hour?

Solution:

TABLE 0
INPUT PARAMETERS

Parameter	Value	Description
$x(0)$	30	Initial no. of bacteria
r	2	Ratio of no. of bacteria at end of hour to start of hour (Common Ratio)
$x(n)$	$r^n x(0)u(n)$	n^{th} term of the GP

From Table 0:

$$x(2) = 120 \quad (1)$$

$$x(4) = 480 \quad (2)$$

$$x(n) = 30(2^n)u(n) \quad (3)$$

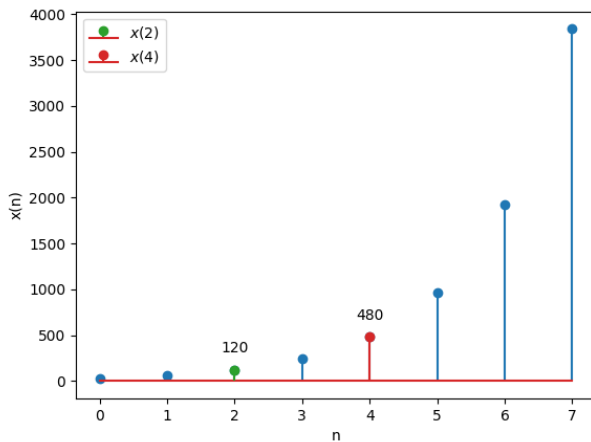


Fig. 0. Plot of $x(n)$ vs n . See Table 0 for details.

$$X(z) = \frac{30z^{-1}}{1 - 2z^{-1}} \quad |z| > 2 \quad (4)$$