EE23BTECH11024 - G.Karthik Yadav*

Exercise 9.1

1. Write the first five terms of the sequence
$a_n = n\,(n+2)$

Solution:

Symbol	Parameters	value
$u\,(n)$	unit step function	
$x\,(n)$	general term of the series	$(n+1)\,(n+3)\,u\,(n)$
$X\,(z)$	Z-transform of $x\,(n)$	?

TABLE I
Input Parameters

$$u\,(n) \xrightarrow{Z} \frac{1}{(1-z^{-1})}, |z| > 1 \tag{1}$$

$$nu\,(n) \xrightarrow{Z} \frac{z^{-1}}{(1-z^{-1})^2}, |z| > 1 \tag{2}$$

$$n^2u\,(n) \xrightarrow{Z} \frac{z^{-1}\,(z^{-1}+1)}{(1-z^{-1})^3}, |z| > 1 \tag{3}$$

$$X\,(z) = \sum_{n=-\infty}^{\infty} (n+1)\,(n+3)\,u\,(n)\,z^{-n} \tag{4}$$

$$= \sum_{n=-\infty}^{\infty} \left(n^2u\,(n) + 4n\,u\,(n) + 3u\,(n)\right) z^{-n} \tag{5}$$

Using eq (1) , eq (2) and eq (3)

$$X\,(z) = \frac{3-z^{-1}}{(1-z^{-1})^3}\ , \qquad |z| > 1 \tag{6}$$

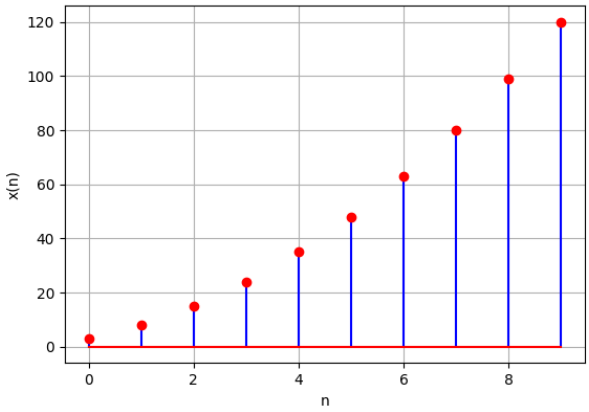

Fig. 1. Plot of x(n) vs n