

# Discrete Assignment

## EE1205 Signals and Systems

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**Question 11.9.1.2:** Write the first five terms of the sequence whose terms are represented by  $x_n = \frac{n}{n+1}$

**Solution:** Given the terms of the sequence are  $x_n = \frac{n}{n+1}$  where  $n = 1, 2, 3, 4, \dots$   
Now

$$x_1 = \frac{1}{2} \quad (1)$$

$$x_2 = \frac{2}{3} \quad (2)$$

$$x_3 = \frac{3}{4} \quad (3)$$

$$x_4 = \frac{4}{5} \quad (4)$$

$$x_5 = \frac{5}{6} \quad (5)$$

Now,

$$u(n) = \begin{cases} 1 & n \geq 0 \\ 0 & n < 0 \end{cases} \quad (6)$$

In terms of  $u(n)$ ,  $x_n$  is

$$x_n = u(n) - \frac{u(n)}{n+1} \quad (7)$$

Z-transform is defined as,

$$P(Z) = \sum_{i=-\infty}^{\infty} P(n).Z^{-n} \quad (8)$$

Here, Z-transform

$$P(Z) = \sum_{i=1}^{\infty} x(n).Z^{-n} \quad (9)$$

$$= \sum_{i=1}^{\infty} \frac{n}{n+1}.Z^{-n} \quad (10)$$

On solving,

$$P(Z) = \frac{Z}{Z-1} + Z \log(1 - Z^{-1}) \quad (11)$$