



Serie N°6 : Z Transform

Exercice N°1 :

Determine the Z transform and its convergence region for the following signals:

- 1- $x(n) = \left(\frac{1}{2}\right)^n u(n)$
- 2- $x(n) = \delta(n - 1)$
- 3- $x(n) = \left(\frac{1}{2}\right)^n u(-n)$
- 4- $x(n) = \delta(n)$
- 5- $x(n) = \delta(n - k) \quad k = \text{constante}$
- 6- $x(n) = -\left(\frac{1}{2}\right)^n u(-n - 1)$

Exercice N°2

Determine using the expansion in partial fractions the signal $x(n)$ whose transform Z is:

$$X(Z) = \frac{Z^2}{Z^2 - 3Z + 2} \quad \text{with } |Z| > 2$$

Exercice N°3

Determine the causal signal $x(n)$ if $X(Z)$ is defined by:

$$1- X(Z) = \frac{1+3Z^{-1}}{1+3Z^{-1}+2Z^{-2}} ;$$

$$2- X(Z) = \frac{Z^{-6}+Z^{-7}}{1-Z^{-1}},$$

$$3- X(Z) = \frac{1+2Z^{-2}}{1+Z^{-2}} ;$$

$$4- X(Z) = \frac{1+2Z^{-1}+Z^{-2}}{1+4Z^{-1}+4Z^{-2}}$$

Exercice N°4

Determine the inverse Z transform of: $X(Z) = \frac{1}{1-1.5Z^{-1}+0.5Z^{-2}}$

For the following convergence regions:

$$1 - \text{ROC} : |Z| > 1 ; \quad 2 - \text{ROC} : |Z| > 0.5 ; \quad 3 - \text{ROC} : |Z| < 1$$

Exercice N°5

Using the properties of the Z transform; determine the signal $x(n)$ whose Z transform is defined by:

$$1- X(Z) = \ln(1-2Z) \quad ; \quad |Z| < 1/2$$

$$2- X(Z) = \ln(1-1/2Z) \quad ; \quad |Z| > 1/2$$