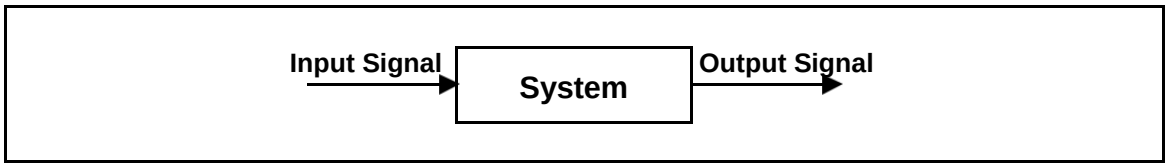
Signals, System and Specification - PART2

1. What is System?

A system is formally defined as an entity, one or more devices and/or software, that manipulates one or more signal to accomplish a function, thereby yielding new signals. The interaction between a system and its associated signals is illustrated schematically in figure below.



Example of systems include

a. An automatic speak recognition system: the input signal is a speech (voice) signal, the system is a computer, and the output signal is the identity of the speaker.

b. A communication system: the input signal could be a speech signal or computer data, the system itself is made up of the combination of transmitter, channel, and receiver, the output signal is an estimate of the original message signal.

c. An aircraft landing system: the input signal is the desired position of the aircraft relative to the runway, the system is the aircraft, and the output signal is a correction to the lateral position of the aircraft.

2. Elementary Signals:

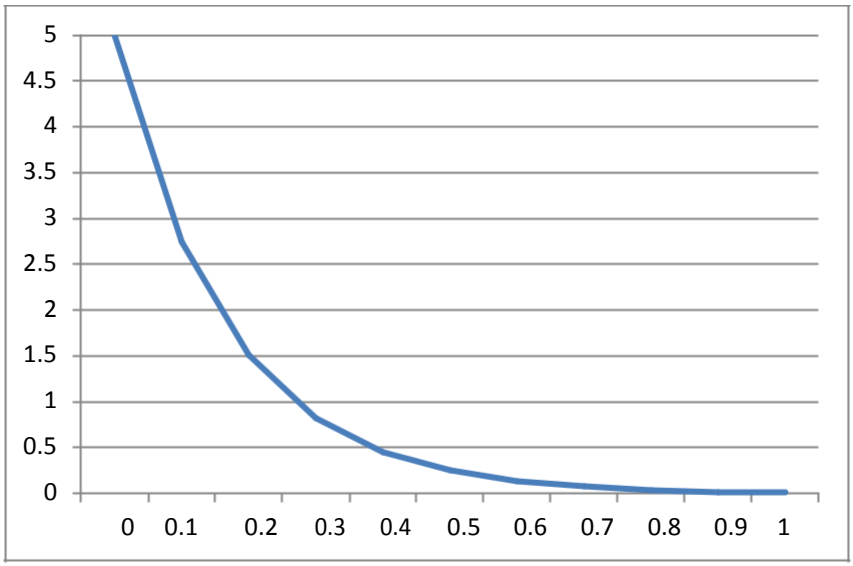
The elementary signals serve as building blocks for the construction of more complex signals. They also important in their own, they may be used to model many physical signals that occur in nature. In what follows, we will describe some of the elementary signals.

a. Exponential Signal: the real exponential signal is defined as:

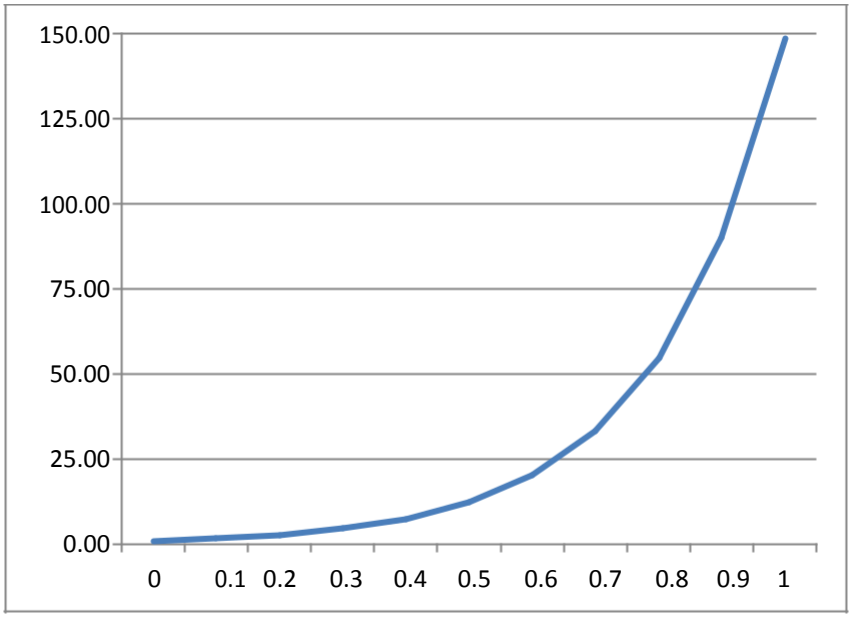
$$X(t) = A\, e^{bt}$$

Where' ***A*** and ***b*** are real.

Here, when b is positive, the signal X(t) will be an exponentially rising; and when b is negative the signal X(t) will be an exponentially decaying signal.

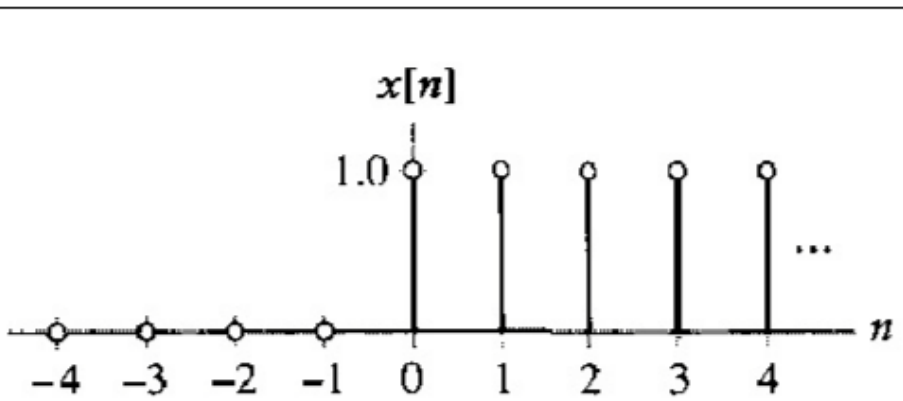


A = 5 & b = -6



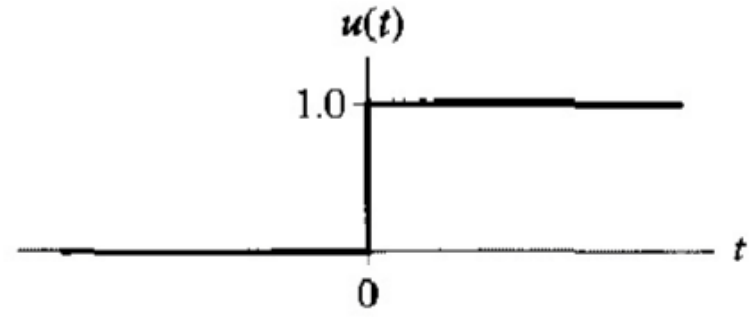
A = 1 & b = 5

b. Step function: the discrete-time version of the step function, commonly denoted by u[n], is defined by :



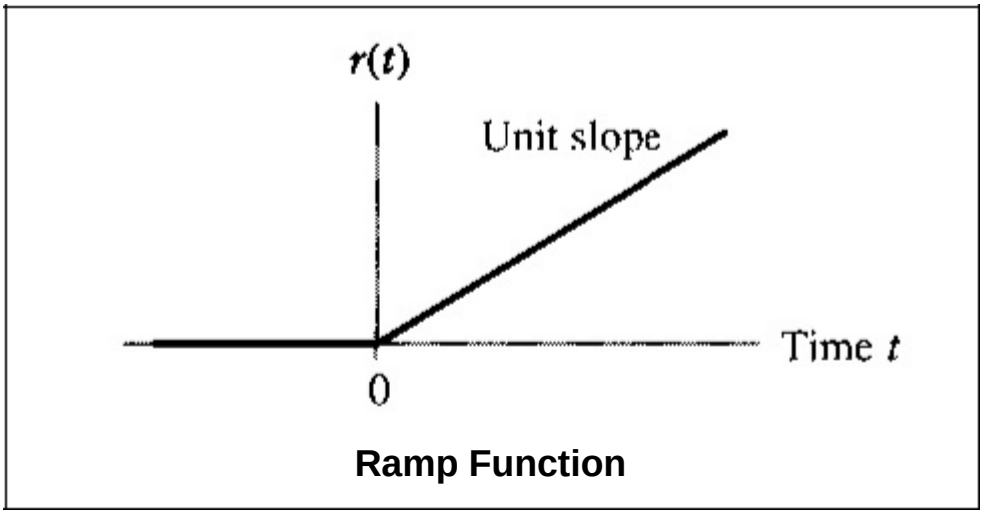
Discrete-Time Step Signal

The continuous-time version of the step function, commonly denoted by u(t), is defined by :



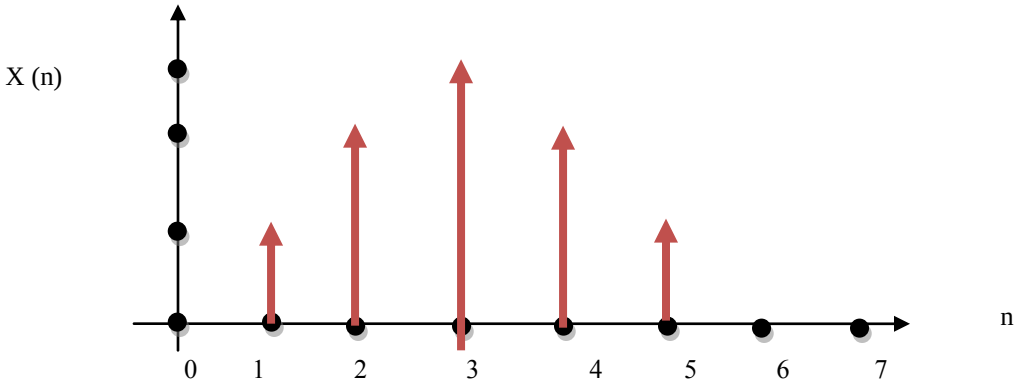
Continuous-Time Step Signal

c. Ramp function: the ramp function commonly denoted by r(t), which is formally defined as follows:



Ramp Function

Examples of shifting, reversing, and time scaling a signal are illustrated



1- X(n-2)
2- X(-n)
3- X(2n)
4- X(n/2)

H.W

Given the sequence x(n)= (6-n) (u(n) – u(n-6)):

1- Y(n)= x (4-n)
2- Y(n) = x(2n-3)
3- Y(n) = x (8-3n)