

Signal analysis

- A **signal** is the function that conveys information about a phenomena.
- In electronics and communications, it refers to any time varying voltage, current or electromagnetic wave that carries information.



- Excitation and Response are given in terms of voltage or currents, which are function of time/frequency.
- Fourier Transform, Laplace Transform and Z-transform are mathematical tools for time domain to frequency domain conversion.

Classifications of Signals:

Periodic and non-periodic signals: A signal that repeats its value at a regular interval of time (called time period) is called periodic signal.

It may be defined mathematically as: $x(t) = x(t + T_0)$, where T_0 is the time period of the signal.

If a signal does not satisfy the above condition, i.e. not repeat itself after a fixed interval of time, it is called non-periodic signal.

Classifications of Signals:

Continuous-time and discrete-time signals: Continuous-time signals (or analog signals) may be defined for every value of time for a continuous interval of time.

Examples of continuous signals are sine wave, cosine wave, triangular wave etc.

Discrete time functions are the sampled version of continuous time functions, in such functions the independent variable is in discrete form.

e.g. $x(n) = 5^n$, where $n = 0, 1, 2, \dots$

Classifications of Signals

Even function

A signal is said to be even or symmetrical signal if inversion of time axis doesn't change its amplitude.

These functions are symmetrical about vertical axis in their domain of representation and satisfies the following condition: $x(-t) = x(t)$.

Odd functions:

A signal is said to be odd if it is negative of its reflection and satisfies the relation: $x(-t) = -x(t)$.

In such signals the inversion of time axis inverts amplitude of the signal.

Classifications of Signals

Deterministic and random signals:

Deterministic are those signals which defined completely at specified function of time, there is no uncertainty about its value at any instant of time.

A random signal contains uncertain information about their values. e.g. noise signals.

