8.1 Time and Frequency Domain Representation of Signals:

- A signal \( x(t) \) can be represented in two domains namely the time domain and the frequency domain.
- The time domain representation is a plot of variation in the signal magnitude with respect to time \( t \) as shown in Fig. 8.1.1(a).
- The time domain representation can provide the information about the shape of the signal, periodicity, time period, amplitude, fundamental frequency, etc.
- But we do not know anything about what frequency components are present and in what proportion are they mixed in order to obtain the particular shape of the signal.
- In order to get all this information, we have to use the frequency domain representation of the signal.
- The frequency domain representation is called as spectrum of the signal which consists of:
  1. Amplitude spectrum
  2. Phase spectrum.
- The amplitude spectrum is a graph of amplitude versus frequency whereas the phase spectrum is a graph of phase versus frequency.
- The frequency domain representation of the given signal can be obtained by using Fourier series for the periodic signals and Fourier transform for the non-periodic signals.
- The spectrums of periodic signals are line spectrums whereas those of non-periodic signals are continuous ones as shown in Fig. 8.1.2(b).