\begin{table}[h]
\centering
\begin{tabular}{|l|l|}
\hline
\textbf{I. Static} & \( y(t) = A_0 \) \\
\hline
\textbf{II. Dynamic} & \\
\textbf{Periodic waveforms} & \\
\hspace{1cm} \textbf{Simple periodic waveform} & \( y(t) = A_0 + C \sin(\omega t + \phi) \) \\
\hspace{1cm} \textbf{Complex periodic waveform} & \( y(t) = A_0 + \sum_{n=1}^{\infty} C_n \sin(n\omega t + \phi_n) \) \\
\textbf{Aperiodic waveforms} & \\
\hspace{1cm} \textbf{Step} \textsuperscript{a} & \( y(t) = A_0 U(t) \) \\
& \hspace{1cm} \text{for } t > 0 \\
& \hspace{1cm} = A_0 \text{ for } 0 < t < t_f \) \\
\hspace{1cm} \textbf{Ramp} & \( y(t) = Kt \) \\
\hspace{1cm} \textbf{Pulse} \textsuperscript{b} & \( y(t) = A_0 U(t) - A_0 U(t - t_1) \) \\
\hspace{1cm} & \( y(t) \approx A_0 + \sum_{n=1}^{\infty} C_n \sin(\omega_n t + \phi_n) \) \\
\hline
\end{tabular}
\caption{Classification of Waveforms}
\end{table}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{ExampleSignals.pdf}
\caption{Examples of dynamic signals.}
\end{figure}
Characterization of Signals

A - Deterministic

1. Static

- Simple periodic waveform

2. Dynamic

a. Simple periodic waveform

b. Complex periodic waveform

B – Random (stochastic)
A – Deterministic (cont)

2. Dynamic (cont)

c. Aperiodic waveform

Step

Ramp

Pulse
Characterization of Signals

B – Random (stochastic)

$$y(t)$$

0 0.5 1

0 5 10

$$t$$

0.5 1

0
Signal Characteristics: Definitions

**Magnitude** - generally refers to the maximum value of a signal

**Range** - difference between maximum and minimum values of a signal

**Amplitude** - indicative of signal fluctuations relative to the mean

**Frequency** - describes the time variation of a signal

**Dynamic** - signal is time varying

**Static** - signal does not change over the time period of interest

**Deterministic** - signal can be described by an equation (other than a Fourier series or integral approximation)

**Non-deterministic** - describes a signal which has no discernible pattern of repetition and cannot be described by a simple equation.

**Mean** - average or static portion of a signal over the time of interest. Sometimes call the *dc component* or the *dc offset* of the signal [Excel tip: **Mean** = AVERAGE(numbers...)]

**RMS** - *root-mean-square* - average value of the square of the signal over the time of interest. [Excel tip: **RMS** = SQRT(SUMSQ(numbers \text{ to n})/n)]
Figure 2.7 Effect of time period on mean value for a nondeterministic signal.

Figure 2.8 Effect of subtracting dc offset for a dynamic signal.