Frequency Domain View of Electronic Signals: Practical Application of the Fourier Theory

Objectives: The Sine Wave and the Time Domain

1. Describe how the term time domain applies to electronic signals.
2. Explain the trigonometric expression that represents a sine wave in the time domain.
3. Determine the instantaneous voltage (v) when given the peak voltage value and frequency.
4. Convert time into an angle theta (θ).
5. Define lead and lag as they apply to the phase of a sine wave.
6. Identify the mathematical expression of a sine wave.
7. Identify the mathematical expression of a cosine wave.

1. What piece of equipment is used to view a time domain signal?
   a. Oscilloscope
   b. Phase meter
   c. Pulse generator
   d. Spectrum analyzer

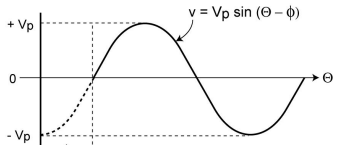
2. Complete the following: Time domain as it applies to electronic signals is the
   a. Length of time it takes a signal to reach its peak value
   b. Plot of the amplitude of the sine/cosine harmonic components
   c. Presentation of time variations over frequency
   d. Presentation of voltage variations over time

3. In a plot of a wave, _____ is shown on the horizontal axis and _____ is on the vertical axis.
   a. Time, voltage variation
   b. Voltage variation, time

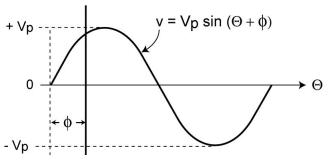
4. Use the mathematical expression ($V = V_P \sin 2\pi ft$) for a sine wave to determine the instantaneous voltage (V) at 70 μS in a 5 kHz sine wave with a peak value (Vp) of 6 volts.
   a. 4.59 volts
   b. 4.85 volts
   c. 5.67 volts
   d. 6.13volts

5. Three (3) rads equals
   a. 119.3°
   b. 171.9°
   c. 249.4°
   d. 326.8°

6. In the mathematical expression for a sine wave in the time domain, what is ωt?
   a. A cosine angle
   b. An angle expressed in radians
   c. The phase angle that represents lag
   d. The phase angle that represents lead

7. 

represents a _____ sine wave.
   a. Lagging
   b. Leading

8. 

represents a _____ sine wave.
   a. Lagging
   b. Leading

9. Which of the following is the mathematical expression of a cosine wave?
   a. v = Vp cos (ωt ± φ)
   b. v = Vp cos (θ ± φ)
   c. v = Vp sin(ωt ± θ)
   d. v = Vp sin (φ ± ωt)

10. A cosine wave has exactly the same shape as a sine wave and is offset by
   a. One eighth of a cycle (45°)
   b. One quarter of a cycle (90°)
   c. One half of a cycle (180°)
   d. One cycle (360°)