Tutorial 2, CS1031

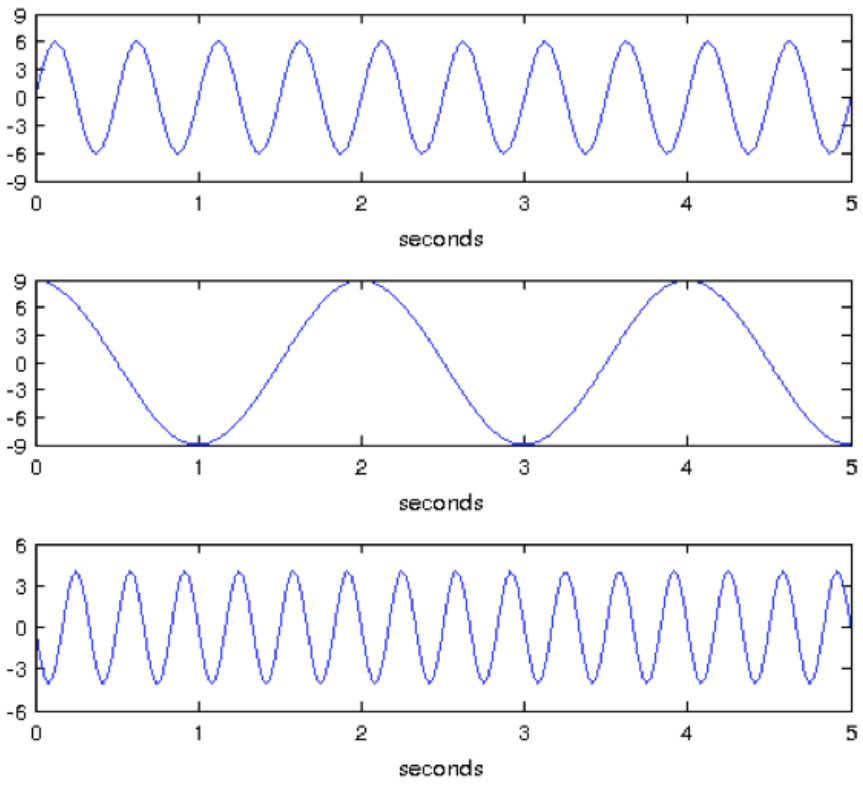
1. Protocol Stack

Match the following tasks to one or more layers of the TCP/IP protocol stack:

a. route determination;
b. connection to transmission media;
c. implementation of a service for the end user;
d. management of an end-to-end communication session between two nodes.

2. Periodic Signals

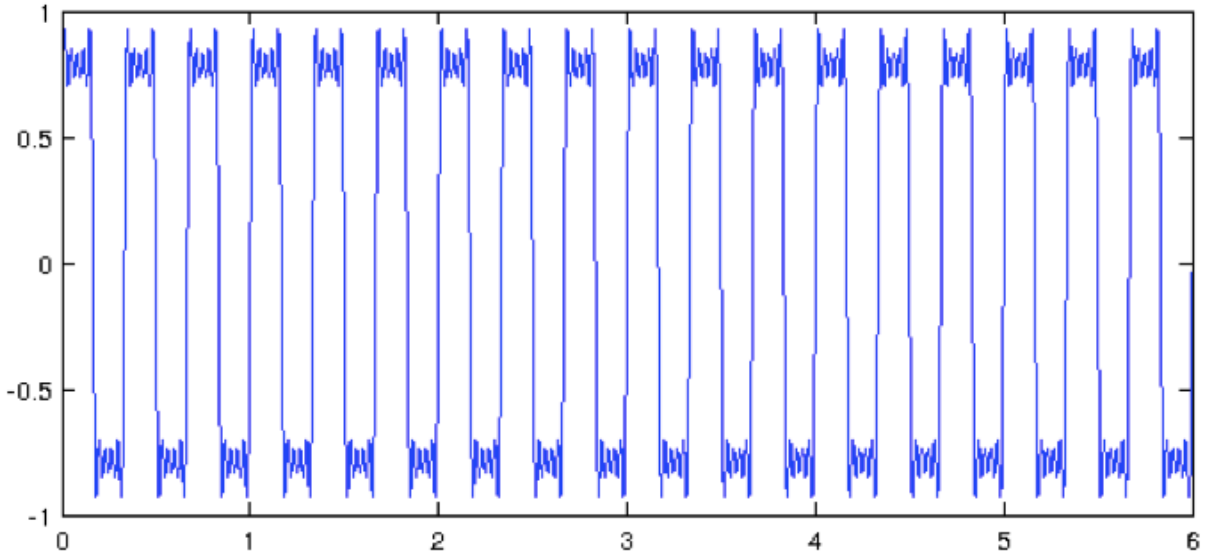
Identify the frequency, the period, the peak amplitude and the phase of the three signals in the figure. Write each signal as a function of time, e.g. $y = A \sin(2\pi f t + \varphi)$.



3. Approximation Through Fourier Series

In the figure you can see the approximation of a square wave obtained using the **first 5 non-zero components of its Fourier series**. Recall that the Fourier series of a square wave can be written as **$\Sigma 1/n \sin(2\pi nft)$** where **n are all odd numbers** and **f is the frequency of the square wave**.

Write down the sinusoidal components that, when summed, give the signal depicted in the figure and sketch each of their graphs with the correct amplitude and frequency.



4. Signal Bandwidth

What is the bandwidth of a signal that can be decomposed into four sine waves of constant amplitude, with frequencies at 80, 110, 140, 170 Hz? Draw the discreet amplitude spectrum of this signal.