

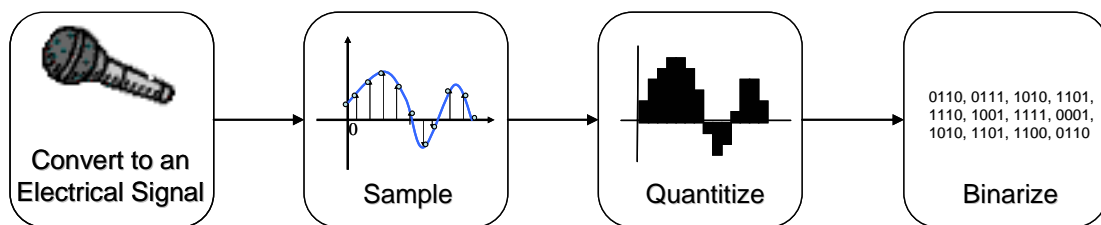
## Solutions CH10 EE100-03

### Problem 1:

Sounds are created by mechanical disturbances in the frequency range 20 Hz to 20 kHz. Sound waves propagate as a series of high and low pressure regions within a medium. A medium is required for sound waves to propagate.

### Problem 6:

The three steps are sampling, quantization, and binarization.



*Sampling:* involves reading the signals value at evenly spaced instants in time.

*Quantization:* the signal samples are assigned one of a pre-selected set of values.

*Binarization:* the quantized values are converted into binary digits to be stored in memory

### Problem 7:

Use the following for a, b, and c.

$$44,100 \frac{\text{samples}}{\text{sec.}} * 2 \frac{\text{Bytes}}{\text{sample}} = 88,200 \frac{\text{Bytes}}{\text{sec.}}$$

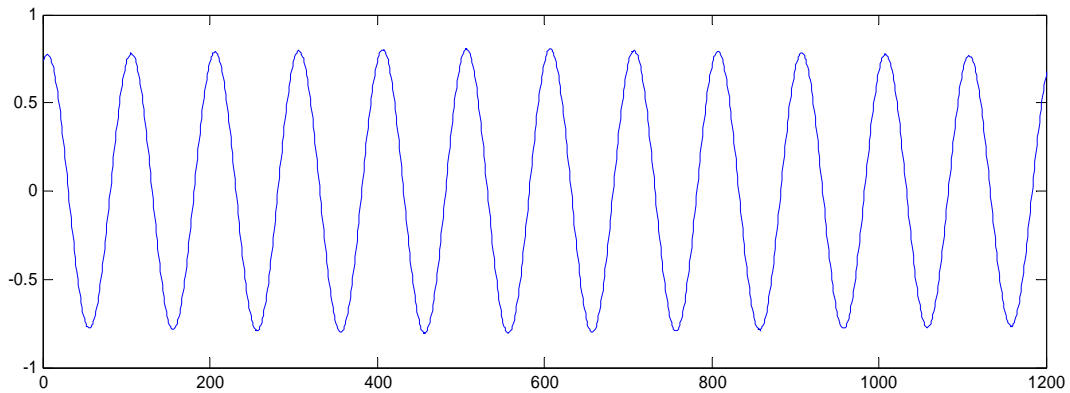
a.  $\frac{1474560 \text{ Bytes}}{88,200 \frac{\text{Bytes}}{\text{sec.}}} \approx 16.7 \text{ sec.}$

b.  $\frac{71680000 \text{ Bytes}}{88,200 \frac{\text{Bytes}}{\text{sec.}}} \approx 8127 \text{ sec.} \approx 2.3 \text{ hr.}$

c.  $\frac{102400000 \text{ Bytes}}{88,200 \frac{\text{Bytes}}{\text{sec.}}} \approx 1161 \text{ sec.} \approx 19.3 \text{ min.}$

**Problem 9:**

Minimal the signal must be samples at a rate of twice it's highest frequency, this is defined as the Nyquist rate.

**Problem 12:**

- a. From plot the number of samples for one period is 100 samples, sampling rate is given as 22,050 samples/sec.

$$T_s = \frac{100 \text{ samples}}{22050 \frac{\text{samples}}{\text{sec}}} = 4.5 \text{ millisecc.}$$

- b. Then to find the primary frequency

$$f = \frac{1}{T_s} = \frac{1}{.0045 \text{ sec.}} = 220.5 \text{ Hz}$$