**Guided Solution for Tutorial 2**

**Q1**



Figure 1.15 A typical DSP system

In Figure 1.15, where can we find

1. continuous-time signals
2. continuous-amplitude signals
3. discrete-time signals
4. discrete-amplitude signals?

Analyse the signal points A to G, it is a combination of continous/discrete time & continuous/discrete amplitude signals.

For example, signal A is continous time and continuous amplitude signal or (ctca) a purely anolog signal.

|  |  |
| --- | --- |
| Signal A | Continuous Time Continuous Amplitude (CTCA) |
| Signal B |  |
| Signal C |  |
| Signal D |  |
| Signal E |  |
| Signal F |  |
| Signal G |  |

## Hint: See Figure 1.15, Page 10 - Processing analog signals using DSP techniques (textbook)

**Q2** A continuous-time analog signal is represented by *x*(*t*) = cos(2000π*t*). This signal is sampled at different sampling frequencies with the first sample taken at *t* = 0.

(a) Sketch the analog signal *x*(*t*) for 0 ≤ *t* ≤ 4 ms.

(b) Sketch the sampled signal for 0 ≤ *t* ≤ 4 ms if the sampling frequency is 8 kHz.

(c) Sketch the sampled signal for 0 ≤ *t* ≤ 4 ms if the sampling frequency is 2 kHz.

(d) Sketch the sampled signal for 0 ≤ *t* ≤ 4 ms if the sampling frequency is 1 kHz.

(e) From the results of (b), (c) and (d), which sampling frequency would yield samples which resemble closely to (a)? Which sampling frequency would produce the worst result?

First, we will need to understand this equation: *x*(*t*) = cos(2000π*t*).

1. It is a cosine wave which is continuous time and continuous amplitude signal.

2. 2000π*t* is corresponding to 2π*f* where f is the frequency of the signal.

3. Determine the period, T= 1/f which is one cycle and do part a.

4. Replace t by nTs where Ts = 1/fs, fs is the sampling frequency for part b, c and d

5. Observed the “sampled” amplitude for various interval of Ts and give comments.

**Hint:** See Figure 1.20, page 14 - Processing analog signals using DSP techniques (textbook)