DSP ASSIGNMENT - 2

List and elaborate the first three footnotes discussed so far in the classroom. Comment on the choice of these topics as being considered for the footnotes.

- **Footnote 1:**

  To decide the number of samples or intervals to be taken on the x-axis for a given signal to convert it from Continuous Time (CT) to Discrete-Time (DT).

  Elaboration: The independent variables such as time, distance, temperature, etc., for many of the signals we interact with daily, can be considered to be continuous. Signals with continuous independent variables are considered to be continuous-time signals. A Continuous-Time (CT) signal consists of infinite points on the x-axis. Hence, to store the signal in any medium, we need to select a finite number of points from the x-axis of the signal, this process is known as sampling and the outcome of the process is a Discrete-Time (DT) signal.

  Comment: Somewhere on Google, a while back, I read about a methodology called "Acceptable Quality Level" (AQL) that can be easily applied to determine product sample size to determine quality. This method defines the number of samples that must be taken from a larger population to determine quality. We can use the same concept used in product quality analysis in our Digital Signal Processing. The better the number of quality samples, the accurate our result will be. Many applications that involve continuous-time signals are implemented using digital signal processing. The continuous-time signals are quantized and coded in digital format to be processed by digital circuits and systems. Hence, we chose this topic as a footnote so that we can understand the basics of what a signal is and what is the actual role of a receiver, to understand that why are DT signals important even when every signal in nature is a CT signal.

- **Footnote 2:**

  Deciding the number of intervals to take on the y-axis for quantizing Discrete-Time (DT) Signal to Digital Signal

  Elaboration: A discrete-time signal is defined only at discrete instants of time. The independent variable has discrete values only, which are uniformly spaced. A discrete-time signal is often derived from the continuous-time signal by sampling it at a uniform rate. When we take a certain number of intervals/levels on the y-axis of DT Signal we put it through a process called quantization. The outcome of this process is a Digital Signal which requires some bits of data the number of quantization levels selected on the y-axis of DT Signal are taken into consideration.

  Comment: I guess for the least erroneous results, the number of quality samples are to decided based on quantization. We chose this statement as the second footnote so that we can form a clear distinction between analog and digital signals. We grouped CT & DT as analog signals.

- **Footnote 3:**

  Every Binary signal is Digital but the converse is not true.

  Elaboration: A **binary signal** is a **digital signal** with two distinguishable levels. A **digital signal** is a **signal** that is being used to represent data as a sequence of discrete values; at any given time it can only take on one of a finite number of values. But, this is not the case with digital signals, they are not confined to just two distinguishable levels. The binary signal is a type of digital signal which uses only 1 bit of data, whereas a digital signal can use more than 1 bit of data depending on the quantization requirement, hence every binary signal is a digital signal but every digital signal is not necessarily a binary signal.

  Comment: Till the time I was in my 2nd year, I assumed that the signals that we will be working upon in EXTC are going to be binary. Later, as soon as I underwent the topic of signals and systems, I came to know that not all the digital signals are binary. This method of separating the footnotes, it has helped me to better distinguish between them.