Bangladesh University of Engineering and Technology

Department of Electrical and Electronic Engineering (EEE)

Course No.: EEE 312 **Section:** A2

Experiment No. 1

Assignment - 1

Instructions: *Each student must submit a hard copy of the report. Include your Matlab code snippets as well as all necessary command window output+plots in your report. Comment on each of your result of the tasks provided.*

1. Consider the given signal below:

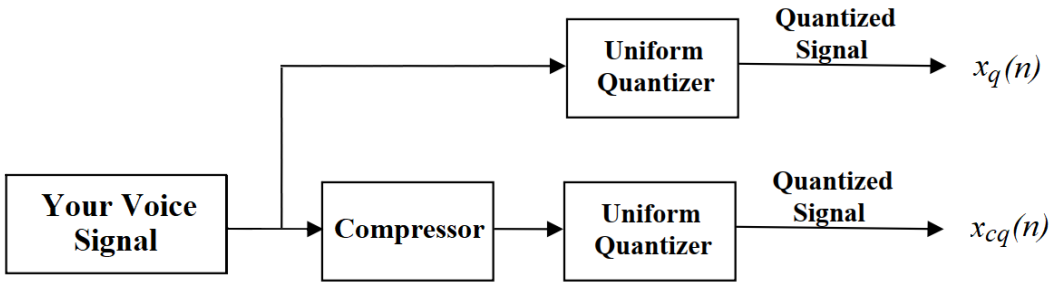
$$y(t) = sin(2\pi * 20 * R * t) + sin(2\pi * 60 * R * t) + sin(2\pi * 120 * R * t);\ \mathbf{0 < t < 1ms}$$

Here, R is the last two digits of your student ID. Now:

(i) Sample the signal with sampling frequencies of (240*R), (360*R), (640*R) and (810*R) samples/sec. From each discrete time signal, obtain the reconstructed signal, $\tilde{y}(t)$ and plot the error signal, $e(n) = \tilde{y}(t) - y(t)$. Plot/Stem every resulting signal and comment on your results.

(ii) Sample the signal by (1500*R) samples/sec. Then, quantize the signal with 3-bit to 8-bit uniform quantizers, separately. Obtain the SQNR for each case and compare them with the theoretical SQNR. From this, plot both experimental and theoretical SQNR with respect to bits in a single plot (use legends).

2. Record your voice as an **.mp3/.wav** file (any one sentence long audio clip of your choice) through your phone and import it to your pc. You can use the `audioread()` function to read the signal. With that function, you shall get a discrete time signal as well as a sampling frequency, F_s. Therefore, complete the following system:



Consider an 8-bit quantizer for the system. Based on the information above:

(i) First take a μ −law compressor (read lab sheet for specifications). Show waveshape of each block's output.

(ii) Listen to both quantized signals using `sound(signal, Fs)`. What difference do you hear? Comment on it.

(iii) Compute the signal to quantization-noise ratio for each case.

(iv) Repeat tasks (i)-(iii) using an A −law compressor.