American International University-Bangladesh (AIUB)
Faculty of Engineering

COE 3101: Data Communication
Mid Term Lab Examination Question Paper

Instructions:

- **MATLAB** must be used to complete the assignment.
- This assignment must be submitted online as a **PDF** file on **VUES** under the component named '**MT LAB EXAM SUBMISSION**'.
- The file name must be '**MT LAB EXAM ID.pdf**', where **ID** is your ID. For example, the file name can be **MT LAB EXAM 19-34567-2.pdf**.
- On cover page of this assignment, **NAME**, **ID**, and **SECTION** must be mentioned clearly.
- **ID** related calculations must be presented clearly.
- Total grade is **10**.
- **Plagiarism will result into 'F' grade.**
- **Deadline: 18/10/2021 (Monday) 3:45 PM.**

Question:

Assume your **ID** is **AB-CDEFG-H**. Following **variable** values are based on your **ID**:
a1 = G+3
a2 = G+5
a3 = G+4
f1 = G+1
f2 = G+9
f3 = G+7
If, **G** is **1** or **3** or **7**, then **L** = **12**
If, **G** is **0** or **5** or **8**, then **L** = **10**
If, **G** is **2** or **4** or **6** or **9**, then **L** = **8**

Generate a composite signal (**sig_ct**) in time domain.
sig_ct = a1*sin(2*pi*f1*t) + a2*cos(2*pi*f2*t + pi/6) + a3*cos(2*pi*f3*t)

a) Apply **uniform quantization** on **sig_ct** **manually**. Use **L** number of levels for quantization. The quantized levels must be in the midpoint of each of the quantization ranges. Show one full cycle of both **sig_ct** and the **quantized signal** in a single figure window in time domain. Insert the code as text and attach one figure. **Legend, label**, and **title** are mandatory. Use '*****' for **sig_ct** and '**x**' for the **quantized signal**. Use such a sampling frequency value so that the points of **sig_ct** and the **quantized signal** are visible clearly and comfortably. **(5)**

b) Assume a noise with standard deviation value of '**F+2**' is present in the transmission channel. Calculate and compare **SNR** of the channel using both MATLAB built-in function and theoretical formula. What is the **capacity** of the channel in bps? Insert your code for **SNR** and **capacity** calculation as text and output results as screenshots. Comment on how well the **SNR** values match, if not then why? **(5)**