**Department of Computer Engineering**



**Cairo University**

**Faculty of Engineering**

**ELC 325B – Spring 2023**

**Digital Communications**

**Assignment #1**

**Quantization**

**Submitted to**

**Submitted by**

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# **Part 1** Implement a uniform scalar quantizer function

A black background with white text

Description automatically generated

Figure 1 Fig

## **Comment:**

A screen shot of a computer program

Description automatically generated

# **Part 2:** Implement a uniform scalar de-quantizer function

## **Comment:**

A computer screen with text and numbers

Description automatically generated

# **Part 3:** Test the quantizer/de-quantizer functions on a deterministic input

## **Comment:**

**NOTE:** in midtread I didn’t should I ignore last level or not ⇒ I included it as no harm

A computer screen with white text

Description automatically generated

## **Output:**

A graph of a line and a line

Description automatically generated with medium confidence

## **Hand analysis:**

A graph of a function

Description automatically generated

A graph on a graph paper

Description automatically generated

# **Part 4:** Test input on a random input signal

## **Utility Code:**

A computer screen shot of a program

Description automatically generated

## **Code:**

A black background with white text and pink numbers

Description automatically generated

# **Plot**

A graph of a line

Description automatically generated with medium confidence

# **Part 5:** Test input on a random input signal

## **Code:**

A screen shot of a computer code

Description automatically generated

## **Plot:**

A graph of a line

Description automatically generated with medium confidence

Figure 5 Fig

## **Comment:**

Not same as theoretical SNR as the input is non uniform

# **Part 6:** quantize the the non-uniform signal using a non-uniform 𝝁 law quantizer

## **Code (Compressor/Expander):**

A computer screen shot of a code

Description automatically generated

## **Code Test:**

A computer code on a black background

Description automatically generated

## **Plot**

A line graph with different colored lines

Description automatically generated

Figure 6 Fig

## **Comment:**

main pipeline:

1. compress non uniform signal (mue, original max\_val, original sign).
2. apply uniform quantizer.
3. apply uniform de-quantizer.
4. Expand it by (mue, original max\_val, original sign)

Getting

**SNR = 10 log10(power of Input / power of Error)**

**Power = mean(signal \*\* 2)**

# **Index:**