1. A line of 6-bit data (64 gray levels in range \(0 \leq f \leq 63\)) from an image has the following values:

\[
\begin{array}{cccccccc}
12 & 12 & 13 & 13 & 10 & 13 & 57 & 54 \\
\end{array}
\]

(a) Construct the line of data that would be obtained by uniform quantization of this data set to 3 bits (8 gray levels).

(b) Construct the sequence of gray values obtained by applying a 3-bit IGS code for this line.

2. Construct the sequence of values that would be obtained from 1-bit error-diffusion for this line, again assuming for 6-bit data.

3. Construct three 8-bit images of size at least \(64 \times 64\) pixels; print out and submit the images (you may alternatively submit electronically).

   (a) a uniform midgray image (i.e., gray value equal to \(1/2\) of the maximum)
   (b) a uniform image with gray value equal to \(1/4\) of the maximum
   (c) an image whose gray values change in a linear “ramp” from gray value \(f = 112\) at one end to gray value \(f = 144\) at the other.

4. Write computer code to implement EITHER of the following quantization algorithms (extra credit for both)

   (a) IGS coding that converts an 8-bit image to a 4-bit image.
   (b) 2-D error-diffused quantization that converts an 8-bit image to a 1-bit image (“bitmap”)

5. Apply the algorithm(s) from the previous problem to the two 8-bit images that you constructed; print out and submit the resulting images (you may alternatively submit electronically) AND describe the action of the algorithms.

6. For extra credit, you may also apply the algorithms to additional images of your choice, describe the result, and submit the images before and after quantization.