Date: 25-10-2020 **Assignment # 01**

Subject: Digital Image Processing

Total Marks: 100

Note: Submit your assignment (Python code) online on Slate. A zero grade will be given if your assignment is found copied. Oral interview is mandatory; I will randomly call you all for an **oral interview** to validate your effort. **Deadline** for submission is **16:00 PKT, Sunday 1st November 2020**.

You can't use any library functions except math functions e.g., log function etc.

Question # 01:

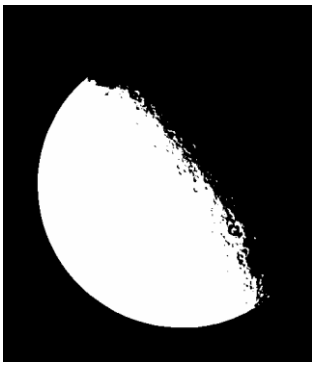
Develop a **Python** program that lets its user to input a **grayscale image** and displays the input image as well as its size. The program should also provide functions to perform each of the following basic operations:

1. The program should provide a function to flip the image vertically. Using this function on an example image i.e., image Moon.bmp should give you results as shown below:

2. The program should also provide a function to generate the negative of an image. This means that a new image is created in which the pixel values are all equal to 1.0 minus the pixel value in the original image.
3. A function with parameter image and plane number to view the bit planes (depending on bit depth) of the input image.
4. A function to display the **contrast value (use average pixel difference definition)** of the image. Use appropriate formula to calculate contrast value.
5. A function to **calculate and display** the average intensity value of the pixels in the image e.g., Moon.bmp and then **thresholds this image** based on this average intensity. Thresholding

means that a new image is generated in which each pixel has intensity 1.0 if the corresponding pixel in the original image has a value above the threshold and 0 otherwise.

Hint: To calculate the average intensity of the pixels in an image simply iterate through every pixel in the image, summing all of their values and finally divide this sum by the total number of pixels. This program should have the following effect on Moon.bmp:



6. A function to perform the **power law transformation (for value of gamma given as input).**
7. A function to perform the **contrast stretching** (given the stretching points from the range of input image's intensity values) transformation.
8. A function to calculate the **entropy** of the input image.
9. The program should also provide a **save function** to save the changed image after each operation.

Note: For testing your program use Chapter 03 images of your textbook. Images are freely available online and can be downloaded from the following link:

Link: http://www.imageprocessingplace.com/root_files_V3/students/students.htm

xxx------- Good Luck! -------xxx