Digital Image Processing Laboratory

1. Take grayscale image of size 512x512 and perform the following operations -
   (a) Decrease its spatial resolution by half every time and observe its change when displaying in the same window size
   (b) Decrease it intensity level resolution by one bit up to reach its binary format observe its change when displaying in the same window size
   (c) Illustrate the histogram of the image and make single threshold segmentation observed from the histogram

2. Take grayscale image of size 512x512 and perform the following operations –
   (a) Perform the brightness enhancement of a specific range of gray levels and observe its result
   (b) Differentiate the results of power law transform and inverse logarithmic transform
   (c) Find the difference image between original and the image obtained by last three bits (MSB)

3. Take grayscale image of size 512x512, add some salt & pepper noise and perform the following operations –
   (a) Apply average and median spatial filters with 5x5 mask and observe their performance for noise suppression in term of PSNR
   (b) Use different size of mask (3x3, 5x5, 7x7) with average filter for noise suppression and observe their performance in term of PSNR
   (c) Apply harmonic and geometric mean filter on the noisy image and compare their performance with PSNR

4. Take grayscale image of size 512x512, add some Gaussian noise and perform the following operations in frequency domain –
   (a) Apply 4th order Butterworth and Gaussian low pass filter to analyze their performance quantitatively
   (b) Observe the ringing effect of ideal low pass filter on the image. Use different radius (D0) of ideal low pass filter and display their results
   (c) Perform edge detection of given the noise and clean image using ideal and Gaussian high pass filters.

5. Read a grayscale image and perform the following operations
   (a) Compare different edge detection algorithms implemented in spatial domain.
   (b) Illustrate the segmentation based on gray level.
   (c) Implement image segmentation using basic global thresholding algorithm
   (d) Demonstrate the segmentation by adaptive thresholding.

6. Take a binary image and a structuring element to perform the following morphological operations –
   (a) Erosion and Dilation operations
   (b) Opening and Closing operations
   (c) Boundary extraction using morphological operation
   (d) Implement the region filling algorithm with morphological operation