



## University of Vavuniya

Third Examination in Information Technology - 2024

First Semester – January 2025

IT3143 Digital Image Processing(Practical)

Answer All Questions

**Time Allowed : Two hours**

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Instructions:

- All the necessary images are given in the folder *IT3143-Resources* on your PC's Desktop.
  - Create a new folder with your index number (e.g IT16001) on your PC's Desktop and use it to save your files.
  - You should use MATLAB programming language to write the programs.
1. Consider the images *hands1.jpg* and *hands2.jpg*. Develop a method to improve the contrast of the image with the following steps using MATLAB functions.
    - (a) Load and display the images *hands1.jpg* and *hands2.jpg*.
    - (b) Write a function *DifferenceImages* that computes the absolute difference between two images pixel-wise (without using MATLAB's *imabsdiff*), and display the resultant image.
    - (c) Compute the absolute difference between "hands1.jpg" and "hands2.jpg" using *DifferenceImages* function and display the output.
    - (d) Replace all pixels in "hands1.jpg" that are brighter than 200 with the corresponding pixel values from "hands2.jpg", and display the modified image.
    - (e) Extract the red channel from "hands2.jpg" and display it
    - (f) Convert "hands1.jpg" to grayscale and display it.

[30%]

*[This question is continued on the next page]*

2. Consider the RGB image *yellowlily.jpg*. Develop a method to process the image with the following steps using MATLAB functions.

- (a) Read and show the original image.
- (b) Convert the image to the HSV color space and do the histogram equalization and display the histogram-equalized images.
- (c) Convert the image to grayscale using the `rgb2gray` function and display the result.
- (d) Apply the *imadjust* function to increase the contrast of the grayscale image and display the result.
- (e) Perform edge detection using the Canny method on the grayscale image and display the edges.

[20%]

3. (a) Consider the image '*circles.png*' and process the image using the following steps:

- i. Extract the boundary of the image by calculating the perimeter.
- ii. Extract the boundary of the image using a suitable structuring element.
- iii. Display the outputs of parts (i) and (ii) in the same plot.

[15%]

(b) Consider the image '*rice.png*' and use the following steps to correct the non-uniform illumination through morphological opening.

- i. Apply the opening to estimate the background.
- ii. Subtract the background from the image.
- iii. Improve the contrast of the image.

[15%]

4. Consider the image '*cameraman.tif*'. Perform the following tasks:

- (a) Apply the Laplacian of Gaussian (LoG) filter with a filter size of [20, 20] and standard deviation 8. Display the filtered image.
- (b) Apply the Laplacian of Gaussian (LoG) filter with a smaller filter size [10, 10] and standard deviation 4, then display the output.
- (c) Apply the Laplacian of Gaussian (LoG) filter with a filter size of [5, 5] and standard deviation 2, and display the result.
- (d) Apply the Sobel edge detection filter and compare the output with the LoG edge detection result.

[20%]