

Assignment 1**Due Date: 27th March 2021****Max Marks: 300+10**

Programming instructions:

1. Programming language: Python
2. The codes should be written from scratch unless mentioned otherwise in respective questions.

Reporting instructions:

1. A single PDF file should be submitted containing all relevant information including data pre-processing, observations, results, and analysis across the problem. Do not put snapshots of code in the report.
2. The PDF file should be properly named with your complete roll number (ex: "XYZassignment1.pdf"), with your name and roll number mentioned inside the report as well. Please make sure that the PDF is included in the same zip file as the codes.

General instructions:

1. DO NOT plagiarise from the internet or your peers. The institute's plagiarism policy will be strictly enforced.
 2. The assignment will be evaluated out of 50% of the total marks in case a report is not submitted.
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Question 1: Filtering

Implement a 3 x 3, 7 x 7, 9 x 9 (i) median and (ii) average filters. Apply each one of them to [this](#) image and comment on the results. Also, compare the results obtained by the two filtering methods. Do not use an inbuilt filter function.

[40+20+20=80]**Question 2: Affine Transformation**

For [this](#) image, perform the following transformations by defining the appropriate transformation matrix.

- (a) Translation by 2 pixels in any direction.
- (b) Scaling by a factor of 2 in the x-direction.
- (c) Rotation by 30 degrees in the anti-clockwise direction.
- (d) A combination of the above three operations.

[10x3+20=50]**Question 3: Image sharpening through Laplacian**

For [this](#) image, save the Laplacian image separately and add it to the input image to sharpen it. Now, compare it with the sharpening filter - as discussed in the class. Do not use the inbuilt

function for Laplacian or sharpening filter.
[30+10 =40]

Question 4: Discrete Wavelet Transform (DWT)

- a) Perform DWT on this [image](#) using Haar and db 9/7 (individually)
- b) Perform smoothing operation on each component
- c) Perform Inverse DWT and obtain the smoothed image
- d) On the original image, apply Gaussian smoothing filter (you can use an inbuilt function here)

Report all the DWT coefficients for both DWT approaches. Draw your analysis of the results of the two approaches.

Is there any difference between the outputs of (c) and (d)? Justify your answer. What is the metric used to evaluate the difference between them? You are allowed to use inbuilt functions.

[10+10+10+5+20+5=60]

Question 5: Image Watermarking techniques

For this [image](#), perform the invisible watermarking using any technique. Use [this](#) image as a watermark. You are allowed to use inbuilt functions.

Bonus: Students will get extra marks if done from scratch.

[20] + bonus=10

Report and Viva = 50 marks