

Con. 3576-09.

Image Processing (3 Hours)

[Total Marks : 100

- N.B.:** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions from the remaining **six** questions.
 (3) Assume suitable **data** if required, state and **justify** the assumption made.

1. Answer the following questions (any **four**) :— 20

- (a) Justify, In a scene with a large amount of detail, it is necessary to sample finely, but Quantization can be coarse.
- (b) Explain why a median filter is called a salt and paper filter. Why its not suitable for Gaussian filter ?
- (c) Explain convolution in the spatial and the frequency domain. Derive the relationship between the two domain.
- (d) What is K-L transform ? Why it is called as method of principle components ?
- (e) Is the Huffman code optimal ? Prove with an example.

2. (a) What is a Frame Buffer ? What are the advantages of Storing Image in Frame Buffer ? 5

- (b) Explain the following Image Enhancement techniques with application :— 15
- (i) Intensity level slicing
 - (ii) Range compression
 - (iii) Edge detection.

3. (a) Compare between contrast stretching and histogram equalization. 5
 (b) A 8 level image is given below ;— 10

$$f(x, y) =$$

4	6	0	3	7
2	1	5	0	3
4	2	7	0	7
1	5	4	6	0
4	7	5	4	1

Image

Prepare the histogram of the given Image. Perform Histogram equalization and draw New this Histogram.

- (c) With the help of Q3(b) show that a second part of histogram equalization will produce exactly the same result. 5

4. (a) Apply Slant Transform and DCT transform on the given Image and compare the result 10

$$f(x, y) =$$

2	2	2	1
2	4	4	2
2	4	4	2
2	2	2	2

Image

- (b) What is Hadamard Transform ? Write a 4×4 Hadamard Matrix and its application. 10
 Is $H(4)$ Orthogonal and Normalized.

5. (a) Show that the Laplacian Operator is invariant to rotation. 5
 (b) Detect the boundary and segment the given image using graph Theoretical 10
 approach also. Draw the graph for the given image.

$$f(x,y) = \begin{array}{|c|c|c|} \hline 4 & 4 & 1 \\ \hline 4 & 1 & 7 \\ \hline 2 & 3 & 7 \\ \hline \end{array}$$

- (c) Explain splitting and merging method of image segmentation with suitable 5
 examples.
6. (a) Classify the different method of Image data compression. Consider a 10
 4 – Pixel line of gray scale data { 120, 145, 186, 232 } which has been
 uniformly quantized with 8-bit accuracy. Construct its 4 bit IGS code.
- (b) Distinguish between : 10
 (i) Lossy compression and lossless compression.
 (ii) Objective fidelity criteria and subjective fidelity criteria.
7. Write short notes on any **four** :— 20
 (a) Connectivity of Pixels
 (b) Zooming of a digital Image
 (c) Haar Transform
 (d) Hough Transform
 (e) Frequency domain filtering
 (f) Homomorphic filtering.