BE8-R4: DIGITAL IMAGE PROCESSING

NOTE:

1. **Answer question 1 and any FOUR from questions 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Time: 3 Hours **Total Marks: 100**

1.

a) List applications of Image Processing

b) Define blind spot. Show the distribution of rods and cones in human eye.

c) Arrange the below given items in increasing order of reflectance:
Stainless steel, Flat white color wall, Black velvet, Snow, Silver Coin.

d) What will be the shape of histogram for below mentioned images?
   i) Bright Image
   ii) Dark image

e) Performance of a lossy compression technique is based on error criterion. Which are the commonly used objective error criterions?

f) Differentiate between image enhancement and image restoration process.

g) What are the applications of landmark detection and matching?

(7x4)

2.

a) Explain Sampling and Quantization in Digital Image Processing.

b) Describe various components of an image processing system.

c) A general gray-level transform can be described as $y = f(x)$ where x is the original pixel value and y is the result after transform. Describe Constant addition and negation transformation.

(8+6+4)

3.

a) Equalize the given histogram

Grey Level	0	1	2	3	4	5	6	7
Number of Pixels	790	1023	850	656	329	245	122	81

b) Consider image subsets S1 and S2.

S1 S2

0	0	0	0	0	0	1	1
0	0	1	0	0	1	0	0
0	0	1	0	1	1	0	0
0	1	1	1	0	0	0	0

For V = {1} determine whether two sub sets are
   i) 4-adjacent
   ii) 8-adjacent

c) Image acquisition and image transmission are two important processes. These two processes are the two principle sources of noise. Describe noise effect of image acquisition by imaging sensors.

(8+6+4)

4.

a)

0	1	0	6	7
2	0	1	6	5
1	1	**7**	5	6
1	0	6	6	5
2	5	6	7	6

Consider 2-dimensional array as a digital image of size 5x5. The centre pixel g(2, 2) is marked bold and underline. Perform image smoothing using a 3x3 neighborhood on centre pixel. What will be the new grey value for center pixel if, we apply:

i) Mean Filter
ii) Median Filter
iii) Min Filter
iv) Max Filter

b) Write a short note on Median Filtering.

c) What is Image Restoration? Explain Uniform Noise.

(6+6+6)

5.

a) Probability distributions for various symbols are given in below in the table. Construct Huffman Code for the given data

Symbol	A	B	C	D	E
Probability	0.25	0.30	0.12	0.15	0.18

b) Write short-note on Variable Length Coding.

c) Compression of an image can be either lossy or lossless based on the application. Explain JPEG Compression.

(6+6+6)

6.

a) Explain High pass Filters for Sharpening in Frequency Domain.

b) Image zooming can be achieved by either pixel replication or interpolation. Apply pixel replication technique and double the size of original image

1	2
5	8

c) Why discrete histogram equalization technique does not yield a flat histogram?

(8+6+4)

7.

a) Write a short note on pseudo coloring.

b) Define the following terms for satellite image processing:

i) Irradiance
ii) Radiance
iii) Absorption
iv) Scattering
v) Transmittance

(8+10)