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) Explain how is contrast adjustment in a digital image is achieved using histogram equalization.
b) What types of information can be extracted from images using image gradient?
c) Explain LZW compression with suitable example.
d) Describe RBG color model. Contrast it with CMYK color model.
e) Explain minimum square error filtering in brief.
f) Differentiate between spatial and frequency filtering.
g) What is meant by mach band effect?

(7x4)

2.

a) Given the data of an image below, show the equalized histogram in tabular form.

Actual number of pixels	6	28	34	94	40	48	2	4
Gray level	0	1	2	3	4	5	6	7

b) What are high pass filter and why these are used in image processing?

(9+9)

3.

a) Apply averaging and weighted averaging filter to pixel at (2, 2), where f(2, 2)=1

11	10	12	13	14
11	1	12	13	2
12	11	12	2	14
11	10	3	13	14
12	3	11	12	13

b) Describe the JPEG compression scheme.

(9+9)

4.

a) Develop the Huffman code for the following symbols having the stated frequencies:

Symbol	Frequency
A	24
B	12
C	10
D	8
E	8

b) Why image restoration is done? Explain the advantages of the Wiener filters.

(9+9)

5.

a) Consider a well known sharpening spatial filter, the Laplacian filter. Find out the corresponding frequency domain filter and analyze it's nature.
b) Describe the edge detection process used in digital image processing. Explain the canny edge detector.

(9+9)

6.

a) Explain YCbCr Color model. How the transformation between YCbCr and RGB takes place?

b) What are Homomorphic filters and how these are different then Fourier transforms?

(9+9)

7.

a) What are the main differences between LZW compression and Huffman compression techniques?

b) Compute the 2-D discrete Fourier transform of the two dimensional image as presented below:

$$f(x, y) = \begin{array}{|c|c|c|c|} \hline 0 & 1 & 2 & 1 \\ \hline 1 & 2 & 3 & 2 \\ \hline 2 & 3 & 4 & 3 \\ \hline 1 & 2 & 3 & 2 \\ \hline \end{array}$$

(9+9)