C7-R4: DIGITAL IMAGE PROCESSING AND COMPUTER VISION

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) Compute the 1-D unitary DFT of input $u = [8\ 1\ 0\ 1]^T$. Also, find its basis vectors and show that their linear combination is equal to the input u.

b) Consider a set of five symbols {a1, a2, a3, a4, a5} having respective probability of {1/2, 1/4, 1/8, 3/32, 1/32} is to be Huffman coded. Obtain the average codeword length and its entropy.

c) Show that Fourier Transform exhibit conjugate symmetry.

d) Find the median output for the following one dimensional function y= {2, 3, 8, 4, 2} and window w= {-1, 0, 1}

e) Why do we prefer DCT instead of DFT for compression?

f) Define opening and closing of set A by structuring element B.

g) Why is dynamic programming used in edge following algorithms?

(7x4)

2.

a) Explain a derivative filter for sharpening an image. Apply it on the image

Z_1	Z_2	Z_3
Z_4	Z_5	Z_6
Z_7	Z_8	Z_9

b) If g(x, y) = f(x+1, y)-f(x, y). Obtain the filter transfer function using FFT and comment on the nature of filter.

c) Differentiate between the median filter and the average filter.

(6+6+6)

3.

a) Comment on the use of the following mask used for line detection

0	1	0
-1	0	-1
0	1	0

-1	0	1
0	0	0
1	0	-1

-2	1	-2
1	4	1
-2	1	-2

1	-2	1
-2	4	-2
1	-2	1

b) Detect the edge for the centre point using prewitt operator for the following image

0	30	60
5	32	62
10	38	64

c) Explain about the wavelet coding.

(6+6+6)

4.

a) Explain the basic relationship between the pixels.
b) Differentiate between contrast stretching and histogram equalization.

(8+10)

5.

a) Explain three procedures used for edge linking.
b) Enumerate the differences between the image enhancement and image restoration.
c) Explain about pseudocolor image processing.

(6+6+6)

6.

a) Derive a transformation matrix for perspective transformation.
b) What do you mean by the shape number? And explain what are the topological descriptors.
c) Explain LZW image compression technique.

(6+6+6)

7.

a) What do you mean by multiresolution analysis? Explain with an example.
b) Explain the main difference between brightness correction and gray scale transformation.
c) Write 8x8 unnormalized Haar matrix. Calculate the energy for each component in output. If $f(n)=[1\ 2\ 3\ 4\ 0\ 0\ 0\ 6]^T$.

(6+6+6)