USN | | | | | | | | | | **17CS753**

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
Digital Image Processing

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a.   Explain the components of image processing system with a block diagram.   **(12 Marks)**
    b.   Define the following :
         i)   Image
         ii)   Digital image
         iii) Digital image processing
         iv)   Euclidean distance   **(08 Marks)**

OR

2   a.   Explain image sampling and quantization.   **(10 Marks)**
    b.   Explain Neighbors of a pixel and types of adjacency.   **(10 Marks)**

Module-2

3   a.   Explain unsharp masking. How is highboost filtering obtained?   **(10 Marks)**
    b.   What is point processing techniques? Discuss following intensity transformation functions:
         i)   Image Negatives
         ii)   Log transformations
         iii) Power – Law (Gamma) transformations   **(10 Marks)**

OR

4   a.   Discuss averaging filters and median filters.   **(10 Marks)**
    b.   Using a 3 × 3 neighborhood and necessary diagram, explain the mechanics of linear spatial filtering.   **(10 Marks)**

Module-3

5   a.   What are the basic steps for filtering in the frequency domain?   **(06 Marks)**
    b.   Define 2-D discrete fourier transform and its inverse.   **(04 Marks)**
    c.   Explain how image smoothing is obtained using ideal lowpass filter and Gaussian lowpass filter.   **(10 Marks)**

OR

6   a.   With a block diagram, explain homomorphic filtering.   **(12 Marks)**
    b.   Discuss any four properties of the two dimensional discrete Fourier transform.   **(08 Marks)**

Module-4

7   a.   Define multiple thresholding. Write the iterative algorithm for global thresholding.   **(10 Marks)**
    b.   Explain canny edge detection technique.   **(10 Marks)**

OR

8 a. Write the basic region growing algorithm based on 8 - connectivity. **(10 Marks)**
   b. For the given horizontal intensity profiles obtain the first and second derivative by mentioning the necessary equations.

5	5	4	3	2	1	0	0	0	6	0	0	-	-

(10 Marks)

Module-5

9 a. Explain coding redundancy. **(06 Marks)**
   b. Define data compression and compression ratio. **(04 Marks)**
   c. With a block diagram, explain image compression model. **(10 Marks)**

OR

10 a. Obtain Huffman code for the following data :

Symbol	a_2	a_6	a_1	a_4	a_3	a_5
Probability	0.4	0.3	0.1	0.1	0.06	0.04

(10 Marks)

   b. Consider the following 4 × 4, 8 bit image of a vertical edge as shown in Fig Q10(a) and a 512 word dictionary with the following starting content table Q10 (a)

$$\begin{bmatrix} 39 & 39 & 126 & 126 \\ 39 & 39 & 126 & 126 \\ 39 & 39 & 126 & 126 \\ 39 & 39 & 126 & 126 \end{bmatrix}$$

Fig Q10(b)

Dictionary Location	Entry
0	0
1	1
.	.
.	.
.	.
255	255
256	-
.	.
.	.
.	.
511	-

Table Q10(b)

Obtain the encoded output using LZW coding. **(10 Marks)**

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