18MT744
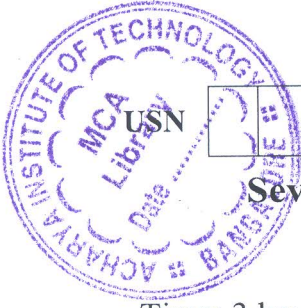
Seventh Semester B.E. Degree Examination, July/August 2022
Digital Image Processing

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   With a neat sketch, explain the components of an Image Processing System.   **(10 Marks)**
    b.   Starting with structure of the Human Eye, illustrate Image Formation with suitable example.
                                                                                    (10 Marks)

OR

2   a.   With a neat block diagram, explain Fundamental steps in Digital Image Processing.
                                                                                    (10 Marks)
    b.   Demonstrate Brightness, Adaption and Discrimination with the help of Weber ratio, Match band effect and Simultaneous contrast.   **(10 Marks)**

Module-2

3   a.   Illustrate Image sampling and Quantization process by considering a continuous image $f(x, y)$.   **(12 Marks)**
    b.   Demonstrate Image Interpolation by considering the suitable example.   **(08 Marks)**

OR

4   a.   Consider the image segment shown below :
         i)   Let $V = \{0, 1\}$ and compute the length of the shortest 4, 8 and m path between p & q.
         ii) Repeat for $V - \{1, 2\}$

$$
\begin{array}{cccc}
3 & 1 & 2 & 1 \ (q) \\
2 & 2 & 0 & 2 \\
1 & 2 & 1 & 1 \\
(p) \ 1 & 0 & 1 & 2
\end{array}
$$
                                                                                    (10 Marks)
    b.   Illustrate different distance measures used in Digital Image Processing with relevant mathematical expression. Also calculate this distance between P(100, 150) to Q(150, 200).
                                                                                    (10 Marks)

Module-3

5   a.   For the 2×2 orthogonal matrix A and image u, obtain the transformed image and basis images and inverse transformation.

$$A = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \qquad u = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}.$$
                                                                                    (10 Marks)
    b.   Discuss the properties of 2 dimensional DFT.   **(10 Marks)**

OR

6   a.   List the properties of Hadamard transform.   **(08 Marks)**
    b.   Generate Haar Basis for N = 2.   **(12 Marks)**

Module-4

7 a. Illustrate Piecewise Linear transformation function, with neat sketch. **(10 Marks)**

b. Perform histogram equalization of an image whose pixel intensity distribution is given in table Q7(b). Construct the histogram of image before and after equalization. **(10 Marks)**

Gray levels	0	1	2	3	4	5	6	7
Number of pixels	790	1023	850	656	329	245	122	81

Table Q.7(b).

OR

8 a. Illustrate Basic Intensity Transformation function with neat graph and mathematical expression. **(10 Marks)**

b. With the help of a block diagram and mathematical expression, demonstrate the homomorphic filtering approach for image enhancement. **(10 Marks)**

Module-5

9 a. Discuss the model of image degradation/restoration. Explain any three noise probability density functions with necessary equations and graphs. **(10 Marks)**

b. Explain any two color models. **(10 Marks)**

OR

10 a. Discuss about Wiener Filtering with all relevant expressions. **(10 Marks)**

b. Explain about Pseudo color image processing. Explain intensity slicing as applied to pseudo color image processing. **(10 Marks)**

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