USN ☐☐☐☐☐☐☐☐☐☐

15EC72

Seventh Semester B.E. Degree Examination, Aug./Sept. 2020
Digital Image Processing

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1 a. With the help of a neat diagram, explain the components of general purpose image processing system. **(08 Marks)**

   b. Explain how image is formed in human eye. Suppose a camera is focused at a pillar of height 2 meters and situated at a distance of 10 metres. The focal length of the image produced in camera. **(06 Marks)**

   c. Consider the two image subsets, S_1 and S_2 as shown in Fig.Q1(c). For $V = \{1\}$ determine whether these two subsets are :

   i) 4 – adjacent

   ii) 8 – adjacent or

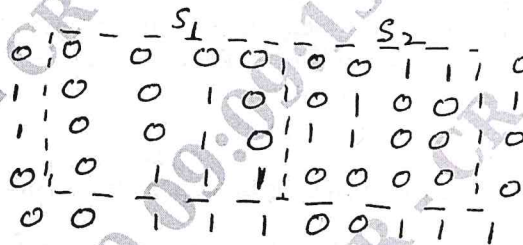   iii) m – adjacent.

Fig.Q1(c) **(02 Marks)**

OR

2 a. Explain the following terms :

   i) False contouring

   ii) Checker board effect

   iii) Neighbors of pixels

   iv) Distance measure. **(08 Marks)**

   b. Define m – adjacency. Compute shortest 4, 8 and m path between p and q for $v = \{1, 2\}$.

3	1	2	1	(q)
2	2	0	2
1	2	1	1
(p) 1	0	1	2

(05 Marks)

   c. Find the time required in seconds to transmit a monochrome image of size $2.5'' \times 2''$ scanned at 150 DPI sent at 28 kilo bits per sec. **(03 Marks)**

Module-2

3 a. Using 2nd order derivative, develop a laplacian mask. **(06 Marks)**

b. What is linear filtering? **(02 Marks)**

c. The following table gives the number of pixels at each of the gray levels 0 to 7 in an image.

n_k	0	1	2	3	4	5	6	7
r_k	123	78	281	417	639	1054	816	688

Draw the histogram corresponding to these grey levels. Perform histogram equalization and draw resulting histogram. **(08 Marks)**

OR

4 a. Explain Homomorphic filters for image enhancement with necessary equations, block diagram and transfer function. **(08 Marks)**

b. Explain smoothing filters in frequency domain. **(04 Marks)**

c. Compute median value of the marked pixels shown below using 3×3 mask.

$$\begin{bmatrix} 18 & 22 & 33 & 25 & 32 & 24 \\ 34 & 128 & 24 & 172 & 26 & 33 \\ 22 & 19 & 32 & 31 & 28 & 26 \end{bmatrix}$$

Fig.Q4(c) **(04 Marks)**

Module-3

5 a. Explain the following noise models :
   i) Gaussian noise ii) Raleigh noise iii) Impulse noise iv) Uniform noise. **(08 Marks)**

b. Explain inverse filter and Wiener filter with the help of equations. Explain the advantages of Wiener filter over inverse filter. **(08 Marks)**

OR

6 a. Define the process of image restoration. How is restoration different from enhancement? **(05 Marks)**

b. What are adaptive filters? Explain adaptive mean filter and its advantages. **(08 Marks)**

c. What are order statistics filters? List any four such filters. **(03 Marks)**

Module-4

7 a. Explain RGB color model in detail listing its applications. What are Wele – safe colors? **(08 Marks)**

b. With the help of block diagram, explain two-band sub-band coding and deciding system with its spectrum. **(08 Marks)**

OR

8 a. What is pseudo color image processing? Explain any one method of pseudo color image processing. **(08 Marks)**

b. Explain cerosion and dilation operations used for morphological processing. **(08 Marks)**

Module-5

9 a. Explain Otsu's algorithm for global thresholding using suitable equations. **(08 Marks)**

b. Explain chain codes for boundary representation. **(08 Marks)**

OR

10 a. Explain the role of Fourier descriptor for boundary representation. **(08 Marks)**

b. What is Lapalcian of a Gaussion (LoG) write a 5×5 LoG mask with the graph? **(08 Marks)**

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