CBCS SCHEME

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18EC733

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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 block diagram, explain the fundamental steps involved in Digital Image Processing. **(10 Marks)**

b. Explain the process of image acquisition using a single sensor. **(06 Marks)**

c. A common measure of transmission for digital data is baud rate (number of bits/Sec.). Each packet consists of byte, a start bit and a stop bit. How many minutes would it take to transmit a 1024 × 1024 image with 256 gray levels using : i) 33.6K baud modem ii) 200K baud modem. **(04 Marks)**

OR

2 a. Explain the components of a general purpose image processing system, with block diagram. **(08 Marks)**

b. Explain with neat diagram, how image is acquired using Linear Sensor Strip. **(06 Marks)**

c. Explain the importance of brightness adaptation and discrimination in image processing. **(06 Marks)**

Module-2

3 a. Explain the process of image sampling and quantization with an example. **(07 Marks)**

b. Perform histogram equalization of a 10 × 10, 3 – bit image having following distribution. Plot the input and output histogram.

Gray level	0	1	2	3	4	5	6	7
Number of pixels	50	25	15	10	0	0	0	0

(07 Marks)

c. Explain image sharpening in spatial domain using second order Laplacian derivative. **(06 Marks)**

OR

4 a. Explain the concept of : i) Gray level slicing ii) Bit plane slicing. **(08 Marks)**

b. Compute the lengths of the shortest 4-, 8- and m-path between p and q in the image segment shown in Fig.Q4(b) by considering V = {1, 2}.

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

Fig.Q4(b) **(06 Marks)**

c. Explain image negative. Determine the negative of a 4 bit image shown in Fig.Q4(c). Plot the histogram of the original image and its negative.

$$\begin{bmatrix} 0 & 12 & 14 & 11 \\ 5 & 10 & 4 & 8 \\ 4 & 9 & 7 & 5 \\ 2 & 15 & 8 & 1 \end{bmatrix}$$

Fig.Q4(c) **(06 Marks)**

Module-3

5 a. Explain Homomorphic filters for image enhancement with necessary equations, block diagram and transfer function. **(10 Marks)**

b. State the following properties of 2D – DFT.
i) Translation ii) Periodicity iii) Rotation iv) Convolution theorem. **(04 Marks)**

c. Compare an Ideal Lowpass filter with a Butterworth Lowpass filter. **(06 Marks)**

OR

6 a. Explain with a block diagram, the basic steps for image filtering in frequency domain. **(06 Marks)**

b. Explain sharpening of images in frequency domain using Ideal, Butterworth and Gaussian Highpass filter. **(09 Marks)**

c. State and prove linearity property of 2D – DFT. **(05 Marks)**

Module-4

7 a. With necessary equations and graph, explain the following noise probability density functions :
i) Gaussian Noise ii) Exponential Noise iii) Uniform Noise. **(06 Marks)**

b. What is inverse filtering? What are its disadvantages? How are they eliminated using Weiner filtering? **(08 Marks)**

c. Explain Adaptive local noise reduction filter. **(06 Marks)**

OR

8 a. Assuming only the presence of noise in an image, explain the following mean filters.
i) Arithmetic mean filter
ii) Geometric mean filter. **(06 Marks)**

b. Apply a 3 × 3 median filter for the marked pixels in the image shown in Fig.Q8(b) and write the result of the filtering.

10	11	12	13	14	15
11	(255)	45	30	23	32
12	23	22	(0)	22	34
13	12	24	22	12	12

Fig.Q8(b) **(06 Marks)**

c. Explain the estimation of degradation function using :
i) Observation
ii) Experimentation. **(08 Marks)**

Module-5

9 a. What is Pseudo color image processing? Explain intensity slicing as applied to pseudo color image processing. **(06 Marks)**

b. With necessary expressions explain erosion and dilation. **(08 Marks)**

c. Explain RGB color model. **(06 Marks)**

OR

10 a. With necessary expressions explain opening and closing operations. List the properties of opening and closing operations. **(10 Marks)**

b. Write the equations for converting colors from
i) RGB to HSI ii) HSI to RGB. **(10 Marks)**

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