



## Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024 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. What is digital image? Explain the fundamental steps of digital image processing. (08 Marks)
- b. Explain the concept of sampling and quantization of an image. (06 Marks)
- c. Mention any four fields that use digital image processing. (02 Marks)

**OR**

- 2 a. Explain with neat diagram, how image is acquired using sensor strips? (08 Marks)
- b. Define 4-, 8- and m-adjacency. Compute the lengths of the shortest 4-, 8- and m-path between p and q in the image segment shown in Fig. Q2 (b) by considering  $V = \{2, 3, 4\}$

	3	4	1	2	0	
	0	1	0	4	2	(q)
	2	2	3	1	4	
(p)	3	0	4	2	1	
	1	2	0	3	4	

Fig Q2(b) (06 Marks)

- c. A common measure of transmission for digital data is the baud rate defined as the number of bits transmitted per second. Generally, transmission is accomplished in packets consisting of a start bit, a byte (8 bits) of information and a stop bit. Using these facts find how many minutes would it take to transmit a  $2048 \times 2048$  image with 256 intensity levels using a 33.6 K baud modem? (02 Marks)

### Module-2

- 3 Explain the following intensity transformation functions :
  - a. Image negatives (05 Marks)
  - b. Log transformation (05 Marks)
  - c. Power – law transformation. (06 Marks)

**OR**

- 4 a. For the given  $4 \times 4$  image of Table Q4(a) having gray scale between 0 to 9, perform histogram equalization and draw the histogram of image before and after equalization. (08 Marks)

2	3	3	2
4	2	4	3
3	2	3	5
2	4	2	4

Table. Q4(a)

- b. Explain the image smoothing in frequency domain using ideal low pass filter. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg,  $42+8 = 50$ , will be treated as malpractice.

Module-3

- 5 a. With necessary equations and graph, explain any four noise probability density functions. (08 Marks)  
 b. Explain minimum mean square error filtering method of restoring images. (08 Marks)

OR

- 6 a. Explain how image degradation is estimated using,  
 (i) Observation (ii) Mathematical modeling. (08 Marks)  
 b. Explain the order statistics filters used for restoring images in the presence of noise. (08 Marks)

Module-4

- 7 a. Explain the process of generating RGB image. (08 Marks)  
 b. Write the formulas used for converting RGB to HSI. Using these formula find the value of HSI for the given RGB = (0.683, 0.1608, 0.1922). (08 Marks)

OR

- 8 a. Draw the block diagram for converting gray level intensity to color transformation and explain it. (08 Marks)  
 b. What is image pyramids? Explain the system for creating approximation and prediction residual pyramids. (08 Marks)

Module-5

- 9 a. Define segmentation and explain segmentation based on discontinuity in intensity levels. (08 Marks)  
 b. Explain Region Based Segmentation. (08 Marks)

OR

- 10 a. Briefly explain the basic edge detection and relate first and second order derivative to gray level profile. (08 Marks)  
 b. Explain the following related to representation and description:  
 (i) Chain codes  
 (ii) Signatures  
 (iii) Skeletons (08 Marks)

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