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18CS741

# Seventh Semester B.E. Degree Examination, July/August 2022 **Digital Image Processing**

Time: 3 hrs.

Max. Marks:

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

### Module-1

- a. Explain the fundamental steps in digital image processing with a neat block diagram. 1
  - Explain the concept of sampling and quantization.

(10 Marks) (10 Marks)

- OR
- a. Briefly explain the following terms:
  - Neighbors of a pixel.
  - (ii) Distance function.
  - (iii) Euclidean distance.
  - (iv) City block distance.

(10 Marks)

- b. Consider the image segment shown,
  - 2 1 (q) 1
  - 2 0 2
  - 2 1 1
  - (p)1 0 1 2

Let  $V = \{1, 2\}$ . Compute the lengths of the shortest 4, 8 and m-path between p and q.

(10 Marks)

### Module-2

a. Explain piecewise-linear transformation functions.

(10 Marks)

Define normalized histogram.

(02 Marks)

c. Consider a 3 bit image (L = 8) of size  $64 \times 64$  pixels (MN = 4096) with the intensity distribution given in the table. Perform histogram equalization.

rk	0	T	2	3	4	5	6	7
$n_k$	790	1023	850	656	329	245	122	81

(08 Marks)

OR

- Explain the following:
  - Image negatives. (i)
  - Log transformations. (ii)
  - Power law transformations.

(10 Marks)

Explain smoothing spatial filters.

(10 Marks)

- Module-3
- Discuss the following frequency domain filters:
  - Ideal high pass filter. (i)<sub>4</sub>

(ii) Butterworth highpass filter. (iii) Gaussian highpass filter.

(10 Marks)

Define 2D Discrete Fourier Transforms (DFT) and its inverse. Explain any three properties (10 Marks)

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(10 Marks)

#### OR

- 6 a. Explain the algorithm for frequency domain filtering with a block diagram. (10 Marks)
  - b. Draw the block diagram of homomorphic filtering for image enhancement and explain it.
     (10 Marks)

### Module-4

- a. Define local and global threshold. Explain how point detection algorithm works. (16 Marks
- b. What conditions need to be satisfied while partitioning an image into regions? (10 Marks)

### OR

- 8 a. Explain the following gradient operators:
  - Roberts cross gradient operators.
  - (ii) Prewitt operators
  - (iii) Sobel operators.
  - (iv) Prewitt and Sobel mask for detecting diagonal edges. (10 Marks)
  - b. Explain global processing via the Hough Transform. (10 Marks)

## Module-5

 Given the following symbols and their probability of occurrence, calculate the code and average length of code. (10 Marks)

Symbol	a <sub>2</sub>	a <sub>6</sub>	aı	a <sub>4</sub>	a <sub>3</sub>	a <sub>5</sub>
Probability	0.4	0.3	0.1	0.1	0.06	0.04

b. Explain Arithmetic coding and Run length coding. (10 Marks)

### OF

- 10 a. Explain the general image compression model with a diagram. (10 Marks)
  - Explain coding redundancy and interpixel redundancy in image compression.

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