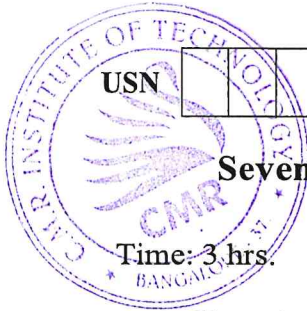


# CBCS SCHEME



USN

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

18CS741

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. Explain the fundamental steps in digital image processing with a neat block diagram. (10 Marks)  
b. Explain the concept of sampling and quantization. (10 Marks)

OR

- 2 a. Briefly explain the following terms:  
(i) Neighbors of a pixel.  
(ii) Distance function.  
(iii) Euclidean distance.  
(iv) City block distance. (10 Marks)
- b. Consider the image segment shown,  
3 1 2 1 (q)  
2 2 0 2  
1 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

- 3 a. Explain piecewise-linear transformation functions. (10 Marks)  
b. 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.

$r_k$	0	1	2	3	4	5	6	7
$n_k$	790	1023	850	656	329	245	122	81

(08 Marks)

OR

- 4 a. Explain the following :  
(i) Image negatives.  
(ii) Log transformations.  
(iii) Power law transformations. (10 Marks)
- b. Explain smoothing spatial filters. (10 Marks)

### Module-3

- 5 a. Discuss the following frequency domain filters:  
(i) Ideal high pass filter.  
(ii) Butterworth highpass filter.  
(iii) Gaussian highpass filter. (10 Marks)
- b. Define 2D Discrete Fourier Transforms (DFT) and its inverse. Explain any three properties of DFT. (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**

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

OR

- 8 a. Explain the following gradient operators:  
 (i) 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**

- 9 a. 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>	a <sub>1</sub>	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)

OR

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

\*\*\*\*\*

CMRIT LIBRARY  
 BANGALORE - 560 037