

B.TECH
(SEM VIII) THEORY EXAMINATION 2018-19
DIGITAL IMAGE PROCESSING

Time: 3 Hours

Total Marks: 100

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x10 = 20

- a. Define components of image processing system.
- b. Name some applications of digital image processing.
- c. Write down mask of Sobel filter.
- d. Differentiate between image enhancement and restoration.
- e. Explain Laplacian filter.
- f. Define Dilation Process.
- g. What is the use of Boundary Extraction?
- h. Define morphological image processing.
- i. What is geometric transformation?
- j. What are first order derivative filters?

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

- a. Consider the image segment shown.

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

- (i) Take $V=\{0,1\}$ and compute the lengths of shortest 4-, 8-, and m-path between p and q. If a particular path does not exist between these two points, explain why.
 - (ii) Repeat for $V=\{1,2\}$
- b. What are the linear and non-linear smoothing filters in spatial domain? Compute the new pixel values after applying the 3x3 box filter on the following 5x5 matrix of a 3-bit image.

2	3	7	0	7
6	4	4	1	5
1	3	2	2	3
4	5	0	6	4
6	1	7	6	4

- c. Explain edge detection and edge linking. Also write the difference between edge detection and edge linking.
- d. What is image restoration? Explain in detail the image restoration in presence of noise only.
- e. Explain the following morphological operations: i. Opening ii. Closing iii. Region Filling.

SECTION C

3. **Attempt any *one* part of the following:** **10 x 1=10**
- (a) Explain low level, mid level and high level image processing. Also explain sampling and quantization process.
 - (b) Explain the process of filtering in frequency domain. Discuss low pass and high pass frequency domain filters.
4. **Attempt any *one* part of the following:** **10 x 1=10**
- (a) Explain piecewise linear transformations of image enhancement with suitable example.
 - (b) Write notes on: i. Bit plane slicing ii. Homomorphic Filter iii. Image histogram
5. **Attempt any *one* part of the following:** **10 x 1=10**
- (a) Discuss order statistics filters with suitable example.
 - (b) Explain the process of minimum mean square error restoration.
6. **Attempt any *one* part of the following:** **10 x 1=10**
- (a) Explain thinning and thickening operation with suitable example.
 - (b) Prove the validity of the duality expressions $(A \bullet B)^c = (A^c \circ B^c)$ and $(A \circ B)^c = (A^c \bullet B^c)$.
7. **Attempt any *one* part of the following:** **10 x 1=10**
- (a) Explain i. Stereo Imaging ii. Multi-level thresholding iii. Image Registration
 - (b) The so-called compass gradient operators of size 3x3 are designed to measure gradients of edges oriented in eight directions: E, NE, N, NW, W, SW, S, and SE. Give the form of these eight operators using coefficients valued 0, 1, or -1.