

Total No. of printed pages = 3

**CSE 1816 PE 31**

Roll No. of candidate

6/8/22

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

BINA CHOWDHURY CENTRAL LIBRARY  
(GIMT & GIPS)  
Azara, Hatkhowapara,  
Guwahati - 781017

2022

**B.Tech. 6<sup>th</sup> Semester End-Term Examination**  
**IMAGE PROCESSING**  
**(New Regulation and New Syllabus)**

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer the following: (MCQ/Fill in the blanks) (10 × 1 = 10 marks)
- (i) How does picture formation in the eye vary from image formation in a camera?
- (a) Fixed focal length  
(b) Varying distance between lens and imaging plane  
(c) No difference  
(d) Variable focal length
- (ii) A second order derivative operator can be defined as
- (a) Laplacian (b) Gaussian  
(c) Histogram (d) None of the above
- (iii) In wiener filtering it is assumed that noise and image are
- (a) different (b) homogeneous  
(c) correlated (d) uncorrelated
- (iv) What is the main idea behind grey-level slicing?
- (a) For brightening the relevant grey-valued pixels and preserving the background  
(b) To give all grey levels of a specific range high value and a low value to all other grey levels.  
(c) All of the above  
(d) None of the above

[Turn over

(v) If the pixels can not be reconstructed without error mapping is said to be

- (a) reversible (b) irreversible  
(c) temporal (d) facsimile

(vi) Erosion followed by dilation is called

- (a) opening (b) closing  
(c) blurring (d) translation

(vii) Example of discontinuity approach in image segmentation is

- (a) edge based segmentation (b) boundary based segmentation  
(c) region based segmentation (d) Both (a) and (b)

(viii) \_\_\_\_\_ is the starting pixel of region growing process.

- (a) seed pixel (b) base pixel  
(c) original pixel (d) image

(ix) The theory of mathematical morphology is based on \_\_\_\_\_

- (a) image size (b) set theory  
(c) probability (d) correlation

(x) Which type of Histogram Processing is suited for minute detailed enhancements?

- (a) Intensive (b) Local  
(c) Global (d) Random

2. (a) Assume you have to process a digital image. What will be the different tools and components of your image processing system? Explain with the help of an example and diagram. (7)

(b) Describe the various types of connectivity between pixels. Give examples. (4)

(c) Explain any two image interpolation techniques. (4)

3. (a) Describe about Inverse 2D Discrete Fourier Transform. (3)

(b) Consider the following 1-D function 'f' and the filter 'w'. (4)

f : 0 0 1 0 1 0 0 0

w : 1 4 2 2 8

Illustrate the 1-D convolution of 'w' with 'f'.

(c) Explain the smoothing of images in frequency domain using

- (i) Ideal low pass filters and  
(ii) Butterworth low pass filters  
(iii) Gaussian Low pass Filters. Also explain what is ringing effect. (8)

4. (a) Given a 3-bit image of size  $32 \times 32$  pixels having intensity distribution as shown in the table given below, where the intensity levels are in the range 0-7. Apply histogram equalization technique and find the transfer function  $T(r)$  which relates input image intensity level  $r_k$  to output image intensity level  $s_k$ . (5+5 = 10)

Intensity Level	Number of Pixels
$r_0 = 0$	76
$r_1 = 1$	344
$r_2 = 2$	211
$r_3 = 3$	103
$r_4 = 4$	57
$r_5 = 5$	127
$r_6 = 6$	47
$r_7 = 7$	59

BINA CHOWDHURY CENTRAL LIBRARY  
 (GIMT & GIPS)  
 Azara, Haikhowapara,  
 Guwahati - 781017

- (b) What is spatial filtering? Why are smoothing spatial filters used? (5)
5. (a) What is the effect of Homomorphic Filtering while enhancing an image? Explain. (5)
- (b) Various NGOs are working to restore the classical images and paintings. What are the issues involved in restoration of the existing images which may not be in very good condition. (5)
- (c) An information source produces sequences of independent symbols A, B, C, D, E, F, G with corresponding probability  $1/3, 1/27, 1/3, 1/9, 1/9, 1/27$  and  $1/27$ . Construct a binary code using Huffman coding algorithm. (5)
6. (a) Define the term image coding and its need/Name various image coding techniques and compare and contrast the transform coding from predictive coding technique. (3+4+3 = 10)
- (b) Compare erosion and dilation with an example. (5)
7. (a) What is wavelet? How can they be used for image compression? (4)
- (b) Explain the concept of Hit or Miss Transformation. (4)
- (c) What is thresholding? Describe in brief the various thresholding methods for image segmentation. (7)