



Name :

Roll No. :

Invigilator's Signature :

CS/MCA/SEM-5/MCA-E-501B/2009-10

2009

IMAGE PROCESSING

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following :

10 × 1 = 10

i) A digital image is composed of a finite number of elements, each of which has a particular location and value. These elements are called

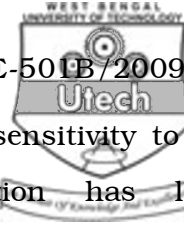
- a) dot
- b) pixel
- c) point
- d) none of these.

ii) The total amount of energy that flows from the light source and it is usually measured in watts (W) is called

- a) Radiance
- b) Luminance
- c) Reflectance
- d) none of these.



- iii) Digitizing the coordinate values of an image is called
- a) Quantization b) Sampling
- c) Segmentation d) Compression.
- iv) The ratio of the vertical points to horizontal points necessary to produce equal-length lines in both directions on the screen is called
- a) Resolution b) Quantization
- c) Aspects ratio d) none of these.
- v) An image of 1024×1024 pixels, in which the gray scale is [0, 255]. How much storage space is required if the image is not compressed ?
- a) $1024 \times 1024 \times 256$ bits
- b) $1024 \times 1024 \times 255$ bits
- c) $1024 \times 1024 \times 8$ bits
- d) none of these.
- vi) Which connectivity arise multiple path connection ?
- a) 4-connectivity b) 8-connectivity
- c) m -connectivity d) none of these.



- vii) The eye does not respond with equal sensitivity to all visual information, which information has less importance than other information in normal visual processing is called
- a) Inter-pixel redundancy
 - b) Coding redundancy
 - c) Psychovisual redundancy
 - d) none of these.
- viii) In which image, histogram covers broad range of the gray scale ?
- a) Dark image
 - b) Bright image
 - c) Low contrast image
 - d) High contrast image.
- ix) Replaces the value of a pixel by the median of the gray levels in the neighborhood of that pixel is called
- a) Mean filter
 - b) Median filter
 - c) Max filter
 - d) Min filter.
- x) Which filter is used to reduce pepper noise ?
- a) Max filter
 - b) Min filter
 - c) Harmonic mean filter
 - d) None of these.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. What is gray image and what is binary image ? What do you mean by gray level and gray scale ? 2 + 3
3. What are the differences between image enhancement and restoration ? What is the equation for getting a negative image ? 3 + 2
4. What is the difference between lossy and lossless image compression. What do you mean by data redundancy, relative data redundancy and compression ratio ? 2 + 3
5. What is Salt and Pepper noise ? What is Quad-tree ? 3 + 2
6. What are mean and median filters ? Compare their performance. 2 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) What is image averaging ?
- b) Discuss Histogram characteristics for dark, bright, low contrast and high contrast images.
- c) Consider the following image :

5	4	12	5
5	5	12	5
5	12	12	11
5	5	11	5

where gray level range is zero to fifteen. Equalize the above image histogram. Show the histogram before and after equalization. 3 + 4 + 8



8. a) Explain Huffman coding in image compression.
 b) Find the entropy of an image of size 4×4 where gray level values are given as

10	10	15	15
15	15	50	50
15	25	25	15
15	15	50	50

- c) Explain DCT. 4 + 6 + 5
9. a) Explain the following filters :
- i) Arithmetic mean filter
 - ii) Geometric mean filter
 - iii) Harmonic mean filter.
- b) "An intensity histogram of an image gives some useful clues about the shape of the objects in the image." Can you agree with this statement ? Give your reasons.
- c) Explain the following two noise removal technique :
- i) Neighbourhood averaging
 - ii) Median filtering.

Calculate the value of the shaded pixel of the following image segment when the above techniques are applied with 3×3 neighbourhood.

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

6 + 1 + 8

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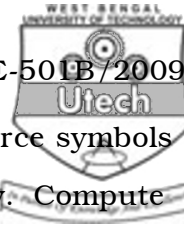


10. a) A waveform $g(x)$ defined at equally spaced set of points $x = 0, 1, 2, 3, 4$ is given by 1, 2, 4, 5, 5.
- Compute the discrete Fourier transform of $g(x)$
 - Compute the amplitude spectrum of $g(x)$.
- b) State and prove convolution theorem.
- c) What is physical significance of convolution and correlation in image processing ?
- d) Demonstrate convolution of the function $f(x)$ and $g(x)$ shown respectively :

Dia.

5 + 4 + 2 + 4

11. a) What are the types of redundancies normally available in an image ?
- b) What is compression ratio ?
- c) What is the role of quantization in image compression ?



- d) Compute the Huffman codes for the source symbols the probabilities of which are given below. Compute the entropy :

Symbol	Probability
S1	0.19
S2	0.21
S3	0.25
S4	0.08
S5	0.16
S6	0.06
S7	0.02
S8	0.03

$$2 + 2 + 4 + 7$$
