

Printed Pages : 3

(ii) Questions : 7

Roll No.

Sub. Code :

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Exam. Code :

9	2	6
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B.Engg. (Information-Technology) 8th Semester

1045

DIGITAL IMAGE PROCESSING

Paper : IT-821/831

Time Allowed : Three Hours]

[Maximum Marks : 50

Note :- Attempt in total **five** questions, selecting at least **two** questions from each Part. The **first** question is compulsory.

1. (i) Differentiate between sampling and quantization.
- (ii) What is the need of transformation from spatial domain to frequency domain ?
- (iii) What is a filter ? What kind of processing can be done on images with the application of filters ?
- (iv) How can we interpret the quality of an image from its histogram ?
- (v) What is image restoration ?
- (vi) How is coding redundancy different from inter-pixel redundancy ?
- (vii) What kind of output do we get on the application of first-order and second-order derivative on an image ?
- (viii) Give an example of semi-automatic and automatic segmentation.

6867/BEG-30574

1

[Turn over

2. Discuss architecture and a

- (ix) What is a pattern class ?
- (x) Discuss the need of pseudo colouring with an example.

10×1=10

PART—A

2. (a) Explain the various steps in image processing using suitable examples. Also discuss some key applications of image processing. 5,5
- (b) What do you understand by Fourier spectrum and magnitude of an image ? Also explain the applications of Fourier transform in digital image processing. 5,5
3. (a) What is local and global image enhancement ? Explain the enhancement techniques used for smoothing, and sharpening.
- (b) What is the need of histogram equalization ? Illustrate the working of the algorithm with a suitable example. 5,5
4. (a) Explain with the help of a diagram the model of restoration process.
- (b) Explain the different noise models. For each kind of noise present in images, also discuss suitable noise filters that can be used. 5,5

PART—B

5. (a) What is image entropy ? How is it useful for image compression ? Explain the JPEG compression algorithm and the different modes supported by JPEG.
- (b) Explain in detail the multiple thresholding technique and region based segmentation algorithms. 5,5

6. (a) How are lines and edges detected? Which operator can be used for line detection? Explain how edge detection is different from Boundary descriptors?
- (b) Find the set of code words and average word length using Huffman coding scheme for a set of input symbols with probabilities given in the table below:

Symbol	A1	A2	A3	A4	A5	A6	A7	A8
Probability	0.03	0.15	0.02	0.15	0.05	0.20	0.10	0.30

5,5

7. What is pattern recognition? What are the various classification techniques that can be used for pattern recognition? Explain any one technique in detail using appropriate example.

10

May/2016

Exam.Code:0926
Sub. Code: 6868

1056
B. E. (Information Technology) Eighth Semester
IT-821/831: Digital Image Processing

Max. Marks: 50

Time allowed: 3 Hours

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting atleast two questions from each Unit.

x-x-x

- I. Attempt the following:-
- What is the difference between computer graphics and image processing?
 - What do you mean by digitization of an image?
 - What is the advantage of image processing in frequency domain over spatial domain?
 - What is pseudo colour processing?
 - How is image degradation different from image restoration?
 - How redundancy helps in image compression?
 - What is entropy?
 - What is machine learning?
 - Discuss in brief the method of generating chain codes? (10x1)
 - Define brightness adaptation?

UNIT - I

- II. a) What are additive and subtractive colour models? Explain with suitable examples.
b) How is histogram useful for image processing? Differentiate between histogram stretching, histogram equalization and histogram matching. (5,5)
- III. a) Discuss the significance of low frequency and high frequency components. Also explain low filtering can be performed in frequency domain?
b) What is the difference between point processing, neighbourhood processing and global processing operations. Explain each with suitable example. (5,5)
- IV. a) What are the various ways in which a digital image is degraded? Also discuss various methods to improve quality of image affected from degradation.
b) Explain: Gradient image, image sharpening, power-law transformation, bit-plane slicing, low pass filter. (5,5)

P.T.O

(2)

UNIT- II

- V. a) What are the different kinds of redundancies which are helpful in image compression? Also explain the Huffman coding technique with suitable example.
- b) What is the reason of using DCT in JPEG compression? Also discuss the variants of JPEG compression algorithm. (5,5)
- VI. a) What are the various operators for line and edge detection? Explain with suitable example.
- b) Explain the basic principle on which the segmentation algorithms are designed. Illustrate and explain the split and merge method for segmentation. (5,5)
- VII. What is pattern matching? Explain one supervised and one unsupervised learning technique for pattern matching using suitable example. (10)

x-x-x

1018
B.E. (Information Technology)
Eighth Semester
ITE-841/821/831: Digital Image Processing

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

- What is the role of quantization in digital image representation?
- How are digital images represented in memory?
- Define any two intensity transformation function?
- Discuss any one spatial filtering technique?
- What is an image histogram?
- What are the various sources of image noise generation?
- What are the different types of edges?
- What are image descriptors?
- What is inter-pixel redundancy?
- What is supervised classification?

UNIT - I

- II. a) What are the key steps involved in the processing of digital images? Also explain two colour models used for representation of images.
- b) What is filtering? How is filtering in spatial domain different from frequency domain filtering? (5,5)

- III. a) Illustrate the application of averaging filter on any five intensity values of following image. What are the techniques to process the boundary pixels?

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

- b) What are the different kinds of image noise? Also discuss the appropriate filters for removal of noise. (5,5)
P.T.O.

(2)

- IV. a) Explain the procedure for histogram equalization?
b) Explain the following: Pseudo colouring, image restoration, homomorphic filtering. (5,5)

UNIT - II

- V. a) Explain the various kinds of redundancies in digital images using suitable examples.
b) Discuss the steps involved in JPEG image compression? (5,5)
- VI. a) How-are edges detected in digital images? Illustrate the working of any two edge detection algorithms.
b) Discuss the key approaches to carry out segmentation. (5,5)
- VII. Write short note on:-
a) Boundary representation
b) Pattern recognition
c) Clustering
d) Chain code
e) Line detector (10)

x-x-x

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

x-x-x

- Q1.
- (i) What is meant by bit-plane slicing?
 - (ii) What are the causes of image degradation?
 - (iii) What is Psychovisual redundancy?
 - (iv) If all the pixels of an image are shuffled, will there be any change in the histogram of the image? Justify your answer.
 - (v) Consider the following image $f(x) = [10 \ 10 \ 10 \ 10 \ 40 \ 40 \ 40 \ 40 \ 20 \ 20]$. What are the first and second derivatives? Locate the position of edge. (5x2)

SECTION - A

- Q2. (a) Explain the method of smootheing the image in frequency domain. (4)
(b) Give the condition(s) under which the D_4 distance between two points p and q is equal to the shortest 4-path between these points. Is this path unique? (3)
(c) What is a wavelet transform? What are the advantages of wavelet transform over the Fourier transform? (3)
- Q3. (a) Apply the following filters on the given image given below and show the intermediate results. (6)
i. Low-pass filter
ii. High-pass filter
iii. Median filter
- | | | |
|---|---|---|
| 1 | 3 | 5 |
| 4 | 4 | 3 |
| 5 | 2 | 2 |
- (b) What is meant by a color model? Why is it necessary? (4)
- Q4. (a) What do you understand by image restoration? Describe how we perform blind image restoration? (3)
(b) What is noise? How it could be modelled based on distribution? (3)
(c) Find the convolution and correlation of the following streams of data: $\{1 \ 7 \ 9 \ 6\}$ and $\{1 \ 3 \ 5\}$ (3)

SECTION-B

- Q5. (a) Consider the simple 4×8 8-bit image:
- | | | | | | | | |
|----|----|----|----|-----|-----|-----|-----|
| 21 | 21 | 21 | 95 | 169 | 243 | 243 | 243 |
| 21 | 21 | 21 | 95 | 169 | 243 | 243 | 243 |
| 21 | 21 | 21 | 95 | 169 | 243 | 243 | 243 |
| 21 | 21 | 21 | 95 | 169 | 243 | 243 | 243 |

P.T.O.

Compute the entropy of the image. Compress the image using Huffman coding. Compute the compression achieved and the effectiveness of the Huffman coding.

- (b) Find an expression for the signature of an equilateral triangle boundary, (3) and plot the signatures.
- (c) Why edges need to be detected in an image. Discuss (2)

Q6. (a) For the image F given below. Show the result of split and merge segmentation algorithm. (4)

```

1 2 3 4 5 6 7 8
9 9 9 9 2 2 2 2
9 9 9 9 2 2 2 2
9 9 9 9 2 2 2 2
9 9 9 9 2 2 2 2
9 9 9 9 2 2 2 2
9 9 9 9 2 2 2 2
9 9 9 9 2 2 2 2

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- (b) Shape is one of the most important feature of an object. Describe how (3) spatial moments are used to characterize the shape of an object.
- (c) Briefly explain the chain code method for boundary representation. (3)

- Q7. (a) Describe how Fourier descriptors are used for boundary description? (5)
- (b) Assuming the quantization thresholds of 32, 48, and 64. Derive the (3) quantization error for each of the following DCT coefficients: 127, 172, 167, 178, -164, and -128.
- (c) Briefly explain arithmetic coding used for image compression. (2)

x-x-x

Printed Pages : 2

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Exam. Code :

9	3	2
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B.Engg. (Electronics & Comm. Engg.) 8th Semester

1045

DIGITAL IMAGE PROCESSING

Paper : EC-808

Time Allowed : Three Hours]

[Maximum Marks : 50

Note :- First Question is compulsory, attempt two questions each from Section B and Section C.

SECTION-A

1. (a) What are the factors that affect the quality of images during acquisition ?
- (b) Which colour model is more suitable for processing of digital images ?
- (c) What are the advantages of doing enhancements in Fourier domains ?
- (d) What are the directional averaging filters ?
- (e) What is convolution ?
- (f) Name any four compressed image formats.
- (g) Define fidelity criteria used for image compression.
- (h) What are rods and cones sensors in human eye ?
- (i) Give any application of image subtraction.
- (j) Why channel encoding is required ? 1×10=10

6938/BEG-30539

[Turn over

V. Explain the basic adaptive resonance theory inputs support in ART 2?

VI. How does self-organizing feature map algorithm relationship between SOFM and learning vector

SECTION-B

2. (a) How images are stored inside the computers ? What are the main properties of the images ? (i) P
(b) How spatial domain filters are applied on images ? (ii) Q 5
3. (a) Consider an image scanner with lots of dust on it. If we scan a photograph using this scanner, what kind of noise will be there in scanned image ? How can we remove this noise ? 5
(b) How images can be smoothened ? Compare median and averaging filters. 5
4. Explain the different Geometric Camera Models and different intrinsic and extrinsic parameters used to calibrate them ? 10

SECTION-C

5. (a) What is the purpose of using orthogonal transformations ? Briefly explain the use of Haar and Slant transformation. 6
(b) What are Lossy compression techniques ? Do we lose data or information in these techniques ? 4
6. (a) Explain the use of Fourier transform on images ? Describe its properties in detail. What changes are made in fast fourier transforms ? 6
(b) Explain the lossless predictive coding technique in detail. 4
7. (a) Explain the different types of redundancies that can be exploited for image compression. 5
(b) Explain bit plane encoding techniques ? Is there any information and data loss in this technique ? 5