Code: 15A04708 **R15**

B.Tech IV Year I Semester (R15) Supplementary Examinations August 2021

DIGITAL IMAGE PROCESSING

(Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define neighbors of a pixel.
(b) Define the following terms: (i) Image. (ii) Digital image.
(c) Explain image negative transformation.
(d) Write short notes on log transformation.
(e) Compare Image enhancement and image restoration.
(f) Explain color complements.
(g) Specify some fundamental conditions of segmentation.
(h) Explain the use of motion in segmentation.
(i) Define spatial and temporal redundancy.
(j) What is the need for compression?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Discuss the basic relationships between pixels.
(b) List out the various applications of digital image processing.

OR

3 (a) Explain the fundamental steps in digital image processing which can be applied to images.
(b) Illustrate homomorphic filtering approach for image enhancement.

UNIT – II

4 (a) Derive the basic function of Walsh transform.
(b) Discuss the properties, applications, advantages and disadvantages of Hoteling transform.

OR

5 (a) Give any five properties of two dimensional DFT.
(b) Explain discrete cosine transform with example.

UNIT – III

6 (a) Explain the use of first derivative for image enhancement by taking a 3 X 3 region of image using the magnitude of the gradient.
(b) Describe the histogram based processing in color images.

OR

7 (a) Explain the periodic noise reduction by frequency domain filtering with respect to notch filter.
(b) Explain the procedure for converting colors from RGB to HIS and vice versa.

UNIT – IV

8 (a) What is the purpose of image restoration? Explain the model of image degradation and restoration process using suitable block diagram.
(b) What are the two approaches for blind image restoration? Explain in detail.

OR

9 (a) Explain linear position invariant degradation employed for image restoration.
(b) Explain how the image gradient is useful in edge detection.

UNIT – V

10 (a) Discuss the Huffman coding with example.
(b) Explain image segmentation by using region growing.

OR

11 (a) Draw the functional block diagram of general image compression system and explain it.
(b) With an example, explain Run-Length coding.

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Code: 15A10801 **R15**

B.Tech IV Year II Semester (R15) Regular Examinations April 2019

DIGITAL IMAGE PROCESSING

(Electronics & Instrumentation Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) List out the various types of adjacency and its significance.

(b) Draw the basic sensor arrangement and define how to transform illumination energy into digital images.

(c) State the periodicity property of 2-D-DFT.

(d) Write any two applications of hotelling transforms.

(e) What is histogram? How to equalize the histogram?

(f) State any two differences between image smoothing and image sharpening.

(g) Mention the disadvantage of inverse filtering.

(h) Define edge linking with an example.

(i) What is bit plane coding and what are its advantages?

(j) List out the various image compression standards.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Elaborate on sampling and quantization of an image in brief.

OR

3 With suitable example, explain the spatial operations on an image and the geometric spatial transformation of an image.

UNIT – II

4 Prove that both 2-D continuous and discrete Fourier transforms are linear operations.

OR

5 Consider an image form of size 2 X 2 and find the 2-D DCT of an image and verify the output after inverse DCT.

$f(m,n) = \begin{Bmatrix} 10 & 5 \\ 5 & 10 \end{Bmatrix}$

UNIT – III

6 Explain any four spatial operations performed on images for enhancement.

OR

7 Elaborate on different histogram techniques used to modify an image with a suitable example.

UNIT – IV

8 Explain the model of image degradation/restoration process and the restoration process using constrained least square error filter.

OR

9 With suitable example, elaborate on the threshold based segmentation methods.

UNIT – V

10 Consider certain images which are represented as (a, b, c, d, e, f) whose probabilities are {0.1, 0.4, 0.06, 0.1, 0.04, 0.3} using Huffman coding. Find its efficiency, redundancy and length of the code.

OR

11 State the advantages of transform coding and explain with suitable block diagram.

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Code: 13A04704 **R13**

B.Tech IV Year I Semester (R13) Supplementary Examinations August 2021

DIGITAL IMAGE PROCESSING

(Electronics & Communication Engineering)

(For 2013, 2014 regular & 2015 lateral entry admitted batches only)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What is the function of image sensor?
(b) What is chess board distance and city block distance between the pixels p and q?
(c) Define unitary DFT.
(d) Why cosine transform is preferred over KL transform?
(e) What is image subtraction and change detection? Give an application of it.
(f) How unsharp masking is done for a image?
(g) Write down the expression for PDF of Rayleigh noise.
(h) Distinguish between region growing algorithm, region splitting and merging algorithm.
(i) State the difference between variable length coding and arithmetic coding.
(j) Define the term Redundancy.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Draw the block diagram of a digital image processing system and discuss in detail the various processes involved in it.

OR

3 (a) Explain about sampling and quantization of an image.
(b) Explain the mathematical operations done on pixel.

UNIT – II

4 (a) Explain the properties of DCT.
(b) Explain about Walsh transform.

OR

5 Compare the properties of unitary transform, discrete Fourier transform, DCT and Hotelling transform.

UNIT – III

6 (a) Describe any three point processing methods applied for image enhancement.
(b) Explain how image smoothing is done in frequency domain.

OR

7 (a) Discuss about Histogram modification.
(b) Explain how colour image enhancement is carried out?

UNIT – IV

8 (a) Discuss about the degradation model used for Image restoration process.
(b) How threshold based segmentation is done for an image?

OR

9 (a) Explain the steps involved in the Edge linking method of image segmentation.
(b) What is constrained least square restoration? Explain.

UNIT – V

10 (a) State and explain Noiseless coding theorem.
(b) Explain about arithmetic coding.

OR

11 (a) Discuss about Huffman coding with an example.
(b) List the features of JPEG 2000 standard.

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Code: 13A04704 **R13**

B.Tech IV Year II Semester (R13) Advanced Supplementary Examinations July 2017

DIGITAL IMAGE PROCESSING

(Electronics & Instrumentation Engineering)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) List the steps involved in digital image processing.

(b) Name the various arithmetic and logical operations that can be done on images.

(c) What are the properties of unitary transform?

(d) Write short notes on hotelling transform.

(e) Compare spatial and frequency domain methods.

(f) Write the application of sharpening filters.

(g) What are the three types of discontinuity in digital image?

(h) What is inverse filtering?

(i) Define compression ratio.

(j) Define arithmetic coding.

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 Explain the basic elements of digital image processing.

OR

3 Explain in detail about:

(a) Image sampling.

(b) Image quantization.

UNIT - II

4 Discuss the properties of discrete Fourier transform.

OR

5 Discuss about Hadamard transform (1-D & 2-D).

UNIT - III

6 Explain image enhancement in the frequency domain.

OR

7 What are image sharpening filters? Explain the various types of it.

UNIT - IV

8 Explain the concept of inverse filtering.

OR

9 What is image restoration? Explain the degradation model for continuous function in detail.

UNIT - V

10 Explain:

(a) Bit plane coding.

(b) Run length coding.

OR

11 How to find Huffman coding for the given data:

Original source symbol	a1	a2	a3	a4	a5	a6
probability	0.1	0.4	0.06	0.1	0.04	0.3

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Code: 15A04708

B.Tech IV Year I Semester (R15) Regular & Supplementary Examinations November/December 2019

DIGITAL IMAGE PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours | Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) What is camera calibration?

(b) An intensity distribution of an image is $f(x,y) = A + A\cos\Pi(3x+4y)$; determine the least sampling frequency, if $x_{min} \le x \le x_{max}$ and $y_{min} \le y \le y_{max}$.

(c) In what aspect DCT is preferred over Hotelling transform.

(d) Calculate the Walsh- Hadmard transformation matrix for an image of size 2 × 2.

(e) Give a mask/ spatial filter that perform image smoothing.

(f) Give an example for a non linear filter.

(g) What is meant by Blind Deconvolution?

(h) Why threshold based segmentation is sensitive to illumination?

(i) Give the expression for Shannon's first theorem.

(j) For the image given with 4 grey levels, find its entropy

$$\begin{matrix} 1 & 1 & 1 & 2 \\ 2 & 2 & 2 & 2 \\ 2 & 3 & 3 & 3 \\ 3 & 3 & 0 & 0 \end{matrix}$$

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) What do you mean by image sampling and digitization?

(b) For the scanned image 'f' shown below having grey levels in the range [0 15]. Quantize f in to 8 levels from 0 to 7.

$$f = \begin{matrix} 1.4 & 5.2 & 7.8 & 15.0 & 14.2 \\ 14.6 & 12.8 & 11.9 & 2.8 & 3.7 \\ 8.3 & 3.3 & 6.2 & 13.4 & 1.2 \\ 6.9 & 14.8 & 0.3 & 6.2 & 4.7 \\ 0.5 & 9.4 & 1.6 & 4.3 & 13.8 \end{matrix}$$

OR

3 (a) Define spatial resolution and grey-level resolution and hence discuss the trade-off between clarity of display versus computational complexity

(b) What are the different ways of measuring distance between pixels? Consider two pixels at locations (3, 4) and (8, 4) respectively. Is it possible to compute the distance in different techniques you mentioned above? Justify.

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Code: 13A04704 **R13**

B.Tech IV Year II Semester (R13) Advanced Supplementary Examinations July 2017

DIGITAL IMAGE PROCESSING

(Electronics & Instrumentation Engineering)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) List the steps involved in digital image processing.

(b) Name the various arithmetic and logical operations that can be done on images.

(c) What are the properties of unitary transform?

(d) Write short notes on hotelling transform.

(e) Compare spatial and frequency domain methods.

(f) Write the application of sharpening filters.

(g) What are the three types of discontinuity in digital image?

(h) What is inverse filtering?

(i) Define compression ratio.

(j) Define arithmetic coding.

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 Explain the basic elements of digital image processing.

OR

3 Explain in detail about:

(a) Image sampling.

(b) Image quantization.

UNIT - II

4 Discuss the properties of discrete Fourier transform.

OR

5 Discuss about Hadamard transform (1-D & 2-D).

UNIT - III

6 Explain image enhancement in the frequency domain.

OR

7 What are image sharpening filters? Explain the various types of it.

UNIT - IV

8 Explain the concept of inverse filtering.

OR

9 What is image restoration? Explain the degradation model for continuous function in detail.

UNIT - V

10 Explain:

(a) Bit plane coding.

(b) Run length coding.

OR

11 How to find Huffman coding for the given data:

Original source symbol	a1	a2	a3	a4	a5	a6
probability	0.1	0.4	0.06	0.1	0.04	0.3

*****

Code: 13A04704

B.Tech IV Year I Semester (R13) Regular Examinations November/December 2016

DIGITAL IMAGE PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) What do you mean by aliasing in the context of image sampling?

(b) Define brightness adaptation.

(c) Mention two important properties of unitary transforms.

(d) The discrete Fourier transform performed for the image f(m, n) is given below.

$$f[m,n]=\begin{bmatrix}0 & 1 & 2\\ 4 & 1 & 4\\ 1 & 2 & 1\end{bmatrix}$$ What will be the value F(0,0)?

(e) What is image filtering?

(f) What is the value of a marked pixel after 3x3 Median filter applied to image matrix A?

$$A=\begin{bmatrix}2 & 1 & 3\\ 1 & \textcircled{1} & 0\\ 4 & 3 & 2\end{bmatrix}$$

(g) Give two applications of image segmentation methods.

(h) What are the drawbacks of inverse filtering?

(i) List two reasons why image compression is important.

(j) What is Psychovisual redundancy?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Explain the fundamental steps involved in typical digital image processing.

OR

3 Explain the following relationships between pixels: Neighbors of a pixel, adjacency, connectivity and regions.

UNIT – II

4 Compute the 2D Discrete Fourier transform of the 4 x 4 gray scale image given below:

$$A=\begin{bmatrix}1 & 1 & 1 & 1\\ 1 & 1 & 1 & 1\\ 1 & 1 & 1 & 1\\ 1 & 1 & 1 & 1\end{bmatrix}$$

OR

5 The basis image of a 2D unitary transform of size 2 X 2 are H_1, H_2, H_3, H_4. Determine the transform coefficients if the input image is f(m, n). Also reconstruct the image using the first two largest coefficients.

Consider $f(m,n)=\begin{bmatrix}6 & 4\\ 2 & 1\end{bmatrix}$, $H_1=\frac{1}{2}\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$, $H_2=\frac{1}{2}\begin{bmatrix}1 & -1\\ 1 & -1\end{bmatrix}$, $H_3=\frac{1}{2}\begin{bmatrix}1 & 1\\ -1 & -1\end{bmatrix}$, $H_4=\frac{1}{2}\begin{bmatrix}1 & -1\\ -1 & 1\end{bmatrix}$.

Contd. in page 2

UNIT – III

6 Explain about image enhancement using frequency domain methods.

OR

7 Perform Histogram equalization of the 4 x 4 image $\begin{bmatrix} 4 & 4 & 4 & 3 \\ 3 & 4 & 5 & 4 \\ 3 & 5 & 5 & 5 \\ 3 & 4 & 5 & 4 \end{bmatrix}$

UNIT – IV

8 Explain in detail about region based segmentation methods.

OR

9 Describe the gradient operators based edge detection with necessary equations and masks.

UNIT – V

10 Obtain the Huffman code for the word **COMMITTEE**.

OR

11 Draw and Explain the transform based image compression scheme.

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Code: 13A04704

R13

B.Tech IV Year I Semester (R13) Supplementary Examinations June 2017

DIGITAL IMAGE PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Distinguish between binary images and grey scale Images.
(b) What is the function of image sensor?
(c) State all possible ways of 2D DFT frequency domain shift property of N X N image.
(d) Find Hadamard transformation matrix for N = 2.
(e) Draw the transfer curve to obtain Image negatives.
(f) Distinguish between spatial domain filtering and frequency domain filtering.
(g) Distinguish between image enhancement and restoration.
(h) State the applications of image segmentation.
(i) Name the transforms used in JPEG and JPEG 2000 standards.
(j) Lossless Image compression is used in medical imaging applications, Justify it.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Discuss the need for non uniform sampling.
(b) Explain the following relationship between pixels: (i) Distance measures. (ii) Connectivity.

OR

3 Derive transformation matrices for:

(a) Translation.
(b) Scaling.
(c) Rotation.

UNIT – II

4 Explain the implementation fast Walsh transform. How it is different from FFT?

OR

5 State and prove following 2D DFT properties:

(a) Translation in spatial domain.
(b) Scaling.
(c) Average value.

UNIT – III

6 Explain following image enhancement techniques:

(a) Bit plane slicing.
(b) Grey level slicing.

OR

7 How image smoothing is done in frequency domain?

UNIT – IV

8 Explain the concept of inverse filtering. What are the limitations of it?

OR

9 Discuss about region based Image segmentation.

UNIT – V

10 Discuss the loss less predictive coding with the help of block diagram.

OR

11 Discuss about subjective and objective Image Fidelity criterions.

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