Printed Page:- Subject Code:- AMTCSE0213

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech

SEM: II - THEORY EXAMINATION (20..... - 20.....)

Subject: Digital Image Processing

Time: 3 Hours Max. Marks: 70

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A 15

1. Attempt all parts:-

1-a. Gamma rays have —– (CO1,K1) 1

(a) energy

(b) power

(c) wavelength

(d) frequency

1-b. The technique of Enhancement that has a specified Histogram processed image, as a result, is called?(CO2, K1) 1

(a) Histogram Linearization

(b) Histogram Equalization

(c) Histogram Matching

(d) None of the mentioned

1-c. The circular convolution of two sequences in time domain is equivalent to(CO3,K2) 1

(a) Multiplication of DFTs of two sequences

(b) Summation of DFTs of two sequences

(c) Difference of DFTs of two sequences

(d) Square of multiplication of DFTs of two sequences

1-d. For noise reduction we use(CO4,K1) 1

(a) image smoothing

.

(b) image contouring

(c) image enhancement

(d) image recognition

1-e. For HSI color space, no of transformations will be(CO5,K1) 1

(a) n = 2

(b) n = 3

(c) n = 4

(d) n = 5

2. Attempt all parts:-

2.a. Calculate the Euclidean distance between the following two pixels in a 2D image: (x1, y1) = (2, 3), (x2, y2) = (5, 7). (CO1,K3) 2

2.b. Explain the role of homomorphic filtering in image enhancement.(CO2,K2) 2

2.c. Write The Properties Of Sine Transform. (CO3,K1) 2

2.d. Illustrate three types of discontinuity in digital image. (CO4, K2) 2

2.e. Define Hue and saturation. (CO5,K1) 2

SECTION-B 20

3. Answer any five of the following:-

3-a. Discuss any four low-level image-processing operations.(CO1,K2) 4

3-b. Perform a 3x3 convolution on the following image using the kernel, and find the 4

$$\text{Kernel: } \begin{pmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{pmatrix} \quad \text{Image: } \begin{pmatrix} 5 & 10 & 15 \\ 20 & 25 & 30 \\ 35 & 40 & 45 \end{pmatrix}$$

output image:(CO1,K3)

3-c. Perform histogram equalization on the following 3x3 image matrix and show the resulting output.(CO2,K3) 4

$$\text{Image: } \begin{pmatrix} 60 & 120 & 180 \\ 80 & 140 & 200 \\ 100 & 160 & 220 \end{pmatrix}$$

3-d. Write the steps involved in frequency domain filtering.(CO2,K2) 4

3.e. Explain the concept of the 1D Ordered Hadamard Transform. Provide the steps for its calculation and illustrate its application.(CO3,K3) 4

3.f. Explain the advanced Techniques for Edge Detection in detail.(CO4,K2) 4

3.g. Explain Psycho-visual redundancy in image compression.(CO5,K2) 4

SECTION-C 35

4. Answer any one of the following:-

4-a. Explain the fundamental steps of image processing. (CO1,K2) 7

4-b. Explain the concept of spatial resolution with example. (CO1,K2) 7

5. Answer any one of the following:-

5-a. Illustrate the concepts of smoothing and sharpening spatial filters with examples. How smoothening impacts the image enhancement. (CO2,K2) 7

5-b. Discuss histogram specification and its differences from histogram equalization. (CO2,K2) 7

6. Answer any one of the following:-

6-a. Differentiate between 1-D DCT transform and 2-D DCT transform.(CO3,K4) 7

6-b. Explain Haar Transform with suitable equations.(CO3,K2) 7

7. Answer any one of the following:-

7-a. Describe the compass and Laplace operators and their role in edge detection.(CO4,K2) 7

7-b. Explain the Hit or Miss transform with example and its use in morphological image analysis.(CO4,K3) 7

8. Answer any one of the following:-

8-a. Explain lossless and lossy compression. Given the following 5x5 image matrix, apply a simple predictive coding method to compress it. Perform both lossless and lossy predictive coding and compare the results. (CO5,K4) 7

$$\text{Image: } \begin{pmatrix} 10 & 20 & 30 & 40 & 50 \\ 60 & 70 & 80 & 90 & 100 \\ 110 & 120 & 130 & 140 & 150 \\ 160 & 170 & 180 & 190 & 200 \\ 210 & 220 & 230 & 240 & 250 \end{pmatrix}$$

8-b. Explain the methods and challenges of color image compression and its importance in reducing data size.(CO5,K4) 7