TE1257

Total No. of Printed Pages: 3

T.E - (Computer) (Sem-VI)(Revised Course 2019-2020)
EXAMINATION JULY 2023
Image Processing & Vision

[Time: 3:00 Hours]　　　　　　　　　　　　　　　　　　　[Max. Marks: 100]

Instructions:　　1.　Answer any five full questions by selecting any two questions from Part A, any two questions from Part B and any one question from Part C.

PART A

Q.1　a)　Consider the image　　　　　　　　　　　　　　　　　　　　　　　12

4	5	13	9
12	9	5	8
6	4	13	8
9	11	4	3

Apply the following operations on the above image and give the corresponding result. Do not use padding
　　1)　Median Filtering
　　2)　Average Filtering
　　3)　Weighted median filtering using the mask $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{bmatrix}$
　　4)　Contrast stretching to stretch the intensity in the original image 3 to 0 in the stretched image and intensity 13 in the original image to 15 in in the stretched image. $(r1, s1) = (3,0)$ and $(r2,s2) = (13,15)$.

　　b)　Write a short note on the following image storage format BMP.　　　　4
　　c)　Differentiate between　　　　　　　　　　　　　　　　　　　　　　4
　　　　1)　Spatial and Grey - Level Resolution
　　　　2)　Sampling and Quantization

Q.2　a)　What is the difference between Filtering in the Spatial domain and Frequency　8　Domain? With a neat diagram illustrate the process of filtering in the frequency domain.

　　b)　Obtain the Fourier Transform of the box function indicated below　　　6
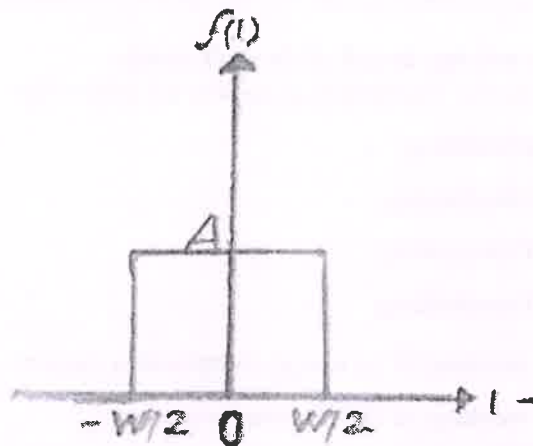
　　c)　Discuss the manner in which a continuous function is sampled and quantized.　　6

1
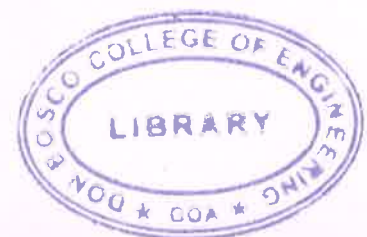
Q.3 a) Gray level histogram of an image is given below. Compute the gray level 12 histogram of the output image obtained by enhancing the input by using the Histogram Matching / Specification technique.

Gray Level	0	1	2	3	4	5	6	7
Frequency	60	220	265	455	500	700	800	1000

Target histogram is as follows:

Gray Level	0	1	2	3	4	5	6	7
Frequency	0.03	0.1	0.01	0.16	0.1	0.15	0.2	0.25

b) 1. Consider the image given below:

9 (p)	8	4	6
7	8	7	7
7	7	5	8
6	4	8	9 (q)

4

Let $V = \{7, 8, 9\}$ Compute the length of the shortest 4-path, 8-path and m- path between pixels p and q.

c) With the help of transformation graphs explain the following grey level 4 transformations:
  1. Intensity Slicing (with and without background)
 2. Logarithmic transformation.

PART B

Q.4 a) Discuss the purpose of the CIE Chromaticity Diagram. 6

b) Calculate the Huffman code for an image having 8 grey levels. Their probability 8 of occurrence is as given below:

Gray Level	0	1	2	3	4	5	6	7
Frequency	0.02	0.04	0.08	0.16	0.32	0.11	0.04	0.23

Calculate the average length of the code words.

c) With respect to the Thresholding answer the following: 6

  1. Global Thresholding

  2. Variable Thresholding

  3. Regional Thresholding

  4. Dynamic Thresholding

Q.5 a) Illustrate the working of an image compression system. 6

b) Illustrate the working of JPEG compression. 8

c) What do you mean by the term colour model? Explain the RGB colour model. 6

F43D3D7A61B8615FF9D122E6D4603AE7
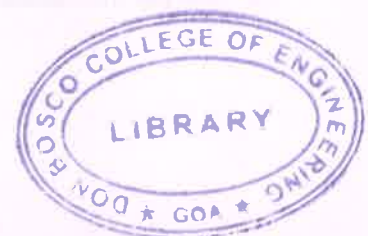
Q.6 a) Identify and describe the 3 redundancies that are reduced or eliminated in data **6**
compression.

b) Explain the following terms with respect to Colour models: **6**
1. Luminance
2. Radiance
3. Achromatic light
4. Chromaticity
5. Trichromatic coefficients of colour
6. Colour Gamut

c) What is thresholding? Consider the following image **8**

1	1	2	2	1	1
2	3	4	4	3	2
4	3	5	5	4	3
1	1	2	2	1	1

Obtain the threshold value and perform thresholding operation.

PART C

Q.7 a) What do you understand by the term "checker board effect" and "False **6**
contouring" in a digital image? What are these effects produced?

b) Explain the Minimum Mean Square Error filter for Image Restoration. **8**

c) Identify the PDF from the histogram given below: (indicate the applications of the **6**
same)
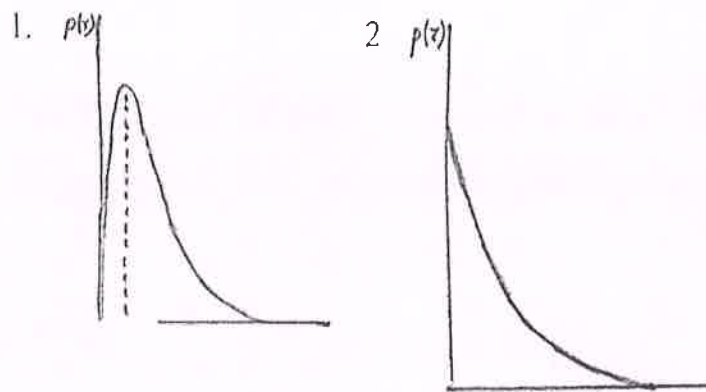
Q.8 a) Illustrate how the Fourier transform of the convolution of two functions in the **8**
spatial domain is equal to the product of the Fourier transforms of the two
functions in the frequency domain.

b) With the help of a neat diagram, explain the fundamental steps in digital image **6**
processing.

c) Summarize the following properties of 2D Discrete Fourier Transform: **6**
1. Spatial and Frequency Intervals
2. Translation and Rotation
3. Periodicity.