B. M. S. College of Engineering, Bengaluru - 560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E.   Semester: V

Branch: Electronics and Communication Engineering   Duration: 3 hrs.

Course Code: 19EC5PE2IP   Max Marks: 100

Course: Image Processing   Date:19.09.2023

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1. a) Define the term 'Image'. Analyze the components of an Image Processing system with relevant diagram. **06**

   b) With appropriate steps, describe the intensity slicing method of Pseudo color image processing. **06**

   c) Consider the image segment shown below: **08**

   (i) Let **V = {10, 12}** and compute the length of the shortest 4,8 and m - path between **p** and **q**. If a particular path does not exist between these two points, explain why?

   (ii) Repeat the above problem considering **V = {10, 14}**

14	12	10	12	10 (**p**)
12	12	14	14	10
14	10	10	14	12
(**q**)10	14	12	14	14
10	12	14	12	10

OR

2. a) Analyze briefly any two color models used in color image processing with appropriate diagrams. **06**

   b) Define resolution. Analyze the process of sampling and quantization of an image with relevant diagrams. **06**

   c) A conventional color image using the RGB coordinate requires 8 bits per color component or 24 bits per pixel. One way to reduce the bit requirement is by converting the RGB to HSI representation. **08**

   Consider the RGB vectors values as given below:

$$\begin{pmatrix} (100, \ 100, \ 100) & (150, \ 0, \ 0) & (0, \ 150, \ 0) \\ (255, \ 0, \ 0) & (255, \ 255, \ 255) & (0, \ 0, \ 0) \\ (100, \ 150, \ 200) & (0, \ 0, \ 255) & (100, \ 200, \ 150) \end{pmatrix}$$

Using the expression for RGB to HSI conversion and thereby determine what are the corresponding H, S, and I values for the image

UNIT - II

3. a) For the images given in **Fig. 3.1** suitable Gaussian filters are applied, comment on the different outputs and also explain the various Gaussian properties and their implications.   **12**
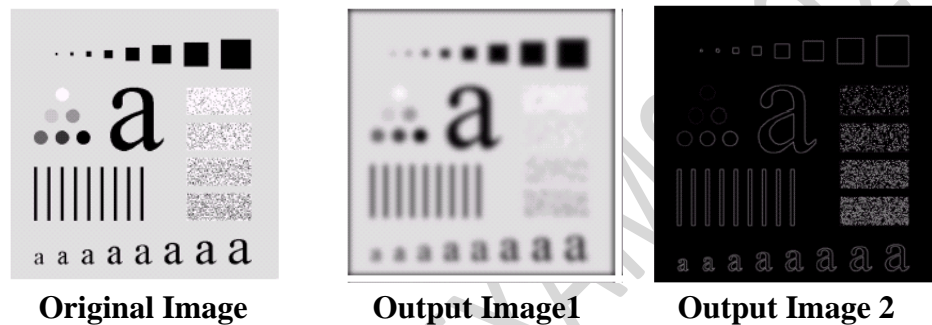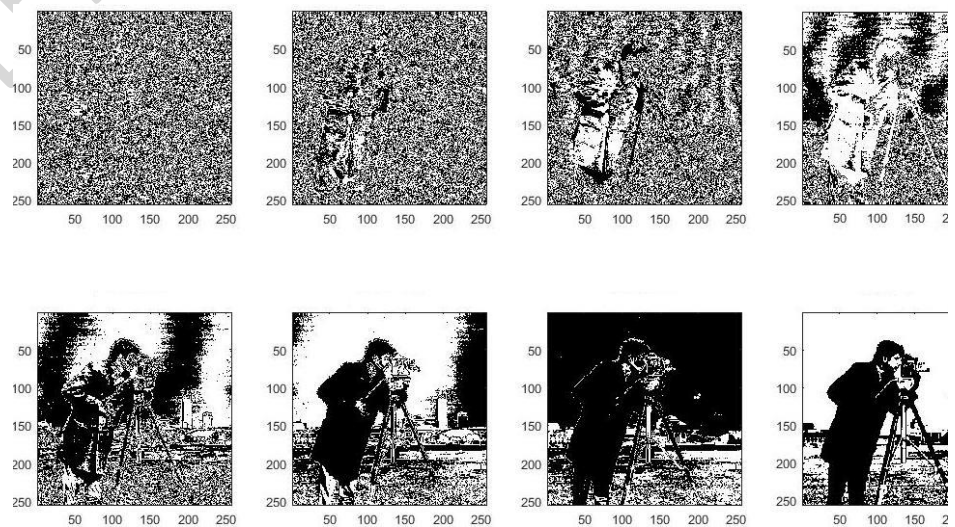

| Original Image | Output Image1 | Output Image 2 |

Fig 3.1

b) Consider the image given in **Fig.3.2** and thereby analyze the enhancement performed and also list its merits.   **08**

Original Image

Output Images   Fig.3.2

OR

4. a) Given an image of size 3X3 as shown below, determine the output image **08**
g(x,y) using logarithmic transformation g(x,y) = C log₁₀ (1+f(x,y)) by
choosing:

(i) C = 1 and **(ii) C = L / log₁₀(1+L)**

$$f(x,y) = \begin{bmatrix} 132 & 209 & 178 \\ 255 & 29 & 187 \\ 69 & 108 & 222 \end{bmatrix}$$

b) Find the value of shaded box in the **Fig. 4.1** given below using mean and **12**
median filtering techniques. Analyze and infer the results of two methods.

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

Fig. 4.1

UNIT – III

5. a) With suitable block diagram and equations, explain the image **08**
degradation/restoration model and thereby derive the expression for a
simple inverse filter.
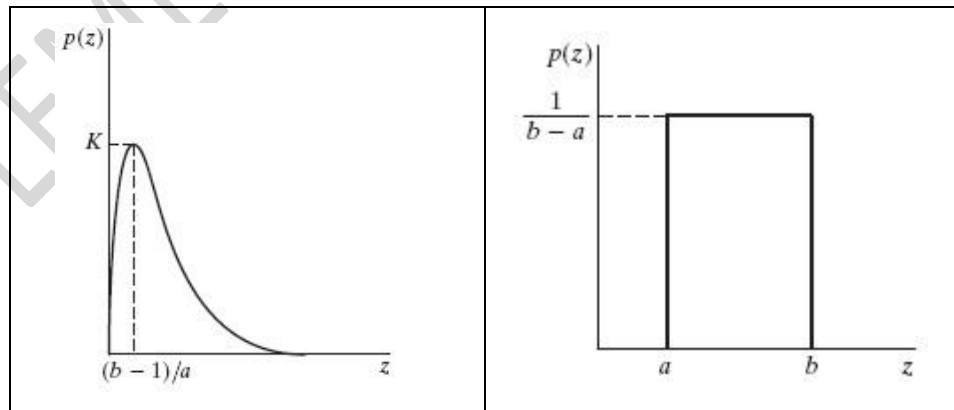
b) Analyze the noise models given in **Fig.5.1**: **06**

Fig.5.1

c) Analyze with relevant equations the concept of Wiener filter. **06**

UNIT - IV

6. a) Using the input image and structuring element as given below in **Fig.6.1**, find the dilated version of the input image.　　**05**
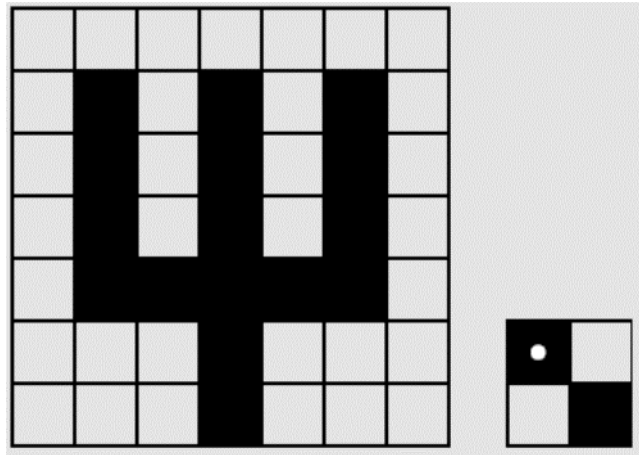

Fig.6.1

b) Using the input image and structuring element as given below in **Fig.6.2**, find the eroded version of the input image.　　**05**
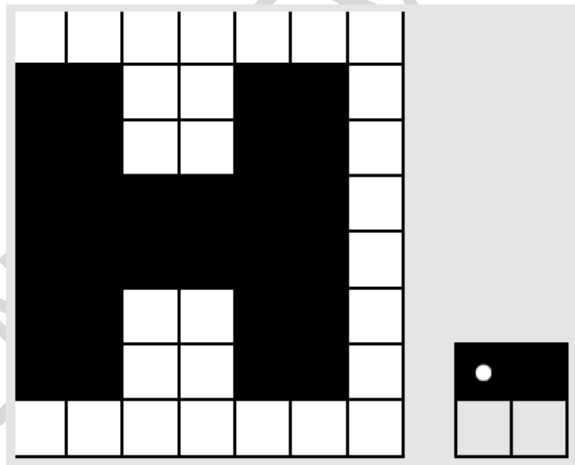

Fig.6.2

c) The input image and structuring elements are shown in **Fig.6.3** below. Find the hit or miss transformation for the input image.　　**10**
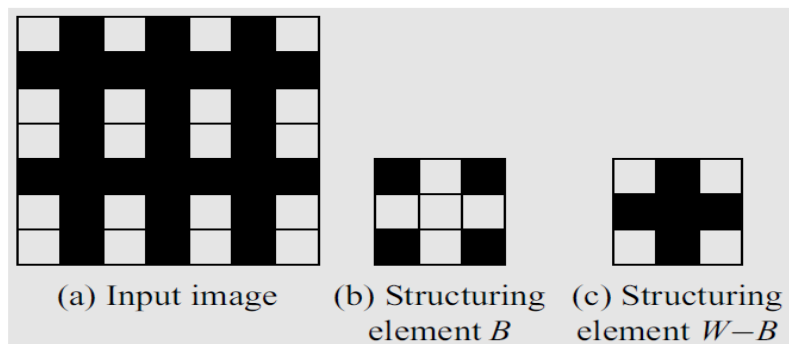

(a) Input image　(b) Structuring element B　(c) Structuring element $W-B$

Fig.6.3

7. a) With relevant equations, analyze the concept of Hough Transform. **10**

   b) Apply split and merge technique to segment the image shown in **Fig.7.1** **10**
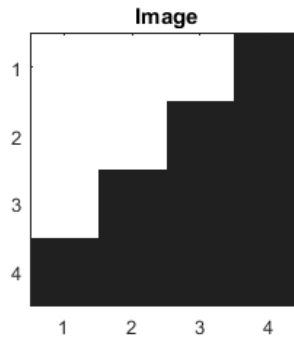   and thereby write its Quadtree representation.

Fig.7.1

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