**DHARMSINH DESAI UNIVERSITY, NADIAD**
**FACULTY OF TECHNOLOGY**
**B.TECH CE SEMESTER - VII**
**SUBJECT: (CE – 714) IMAGE PROCESSING**

| | | | | | |
|---|---|---|---|---|---|
| **Examination** | **:** | **First Sessional** | **Seat No** | **:** | _____ |
| **Date** | **:** | **25/08/2020** | **Day** | **:** | **Tuesday** |
| **Time** | **:** | **10:00 to 11:15** | **Max Marks** | **:** | **36** |

**INSTRUCTIONS:**
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

**Q.1 Do as Directed** **[12]**

(a) Consider following 8-bit image. Produce its 8th bit (MSB) plane and 1st bit (LSB) plane. **[2]**

| | | | |
|---|---|---|---|
| 255 | 128 | 255 | 128 |
| 128 | 255 | 128 | 255 |
| 64 | 127 | 64 | 127 |
| 127 | 64 | 127 | 64 |

(b) Can two different images have same histogram? Explain with suitable example. **[2]**

(c) Histogram of the 2 bit, 5 x5 image is given by **[2]**

| **Pixel Intensity $r_k$** | **0** | **1** | **2** | **3** |
|---|---|---|---|---|
| **Number of pixels $n_k$** | 7 | 6 | 5 | 7 |

Find the average value of the intensities in the image.

(d) Person eye is looking a palm tree from 300 m distance. The actual height of a palm tree is 40 m. What is the height of the palm tree in the retinal image? **[2]**

(e) Discuss Alpha-trimmed mean filter. **[2]**

(f) Give details on photopic and scotopic vision. **[2]**

**Q.2 Answer the following questions (Any Two)** **[12]**

(a) Consider the given image segment of 3x3. Find value at the highlighted pixel, if **[6]**

| | | |
|---|---|---|
| 1 | 7 | 5 |
| 6 | (2) | 3 |
| 1 | 4 | 2 |

1. 3x3 Arithmetic Mean filter is applied
2. 3x3 Geometric Mean filter is applied
3. 3x3 Harmonic Mean filter is applied
4. 3x3 Mid point filter is applied.
5. 3x3 Median filter is applied.

Show your calculation.

(b) Consider the following binary images of the same size with white (1-valued) and black(0-valued) pixels. Perform following logical operations and show the results. Explain your answers in brief. **[6]**

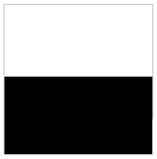


Image :1

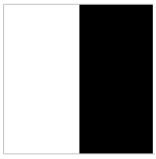


Image:2

1. NOT(Image 1)
2. AND(Image1,Image2)
3. OR(Image1,Image2)
4. XOR(Image1,Image2)

(c) 1. Consider the two image subsets, S1 and S2 in the following figure. Assuming that V={1}, determine whether these two subsets are: a) 4-adjacent b) 8-adjacenet c) M-adjacent . Justify your answer **[3]**

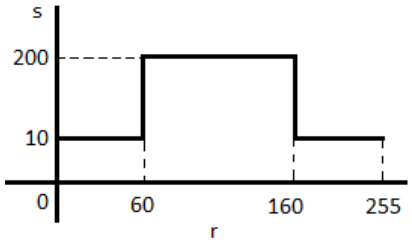

2. Let P and Q be pixels at coordinates (5,5) and (10,15) respectively. Find out Euclidean distance, city block distance and chess board distance between the pixels. Show your calculation. **[3]**

**Q.3 Attempt the following questions** **[12]**

**a)** The following matrix represents the pixels values of an 8 bit image, apply following transforms and find the resulting image. Show your calculation. **[4]**

| | | | |
|---|---|---|---|
| 200 | 50 | 100 | 150 |
| 55 | 200 | 55 | 55 |
| 100 | 100 | 50 | 55 |
| 200 | 100 | 150 | 50 |

1. Image negation.
2. Thresholding with threshold value 95. Consider output intensity levels 0 & 255.
3. Intensity transformation given below. What would be the impact of second pass of the same intensity transformation? What will be the impact of third pass?




**b)** Find Fourier transform of $\delta(t - t_0)$. **[2]**

**c)** Consider the following 1-D function *f*, and a filter *w*. Determine 1-D correlation of the filter with function. Show your calculation. **[6]**

$f$: 0 0 0 1 1 1 0 0 0 $\quad\quad$ $w$: 0 1 1 1 0

Will the result of the convolution be different from the obtained correlation? Why?

**OR**

**Q.3 Attempt the following questions** **[12]**

**a)** Consider the following 4 bit image. Apply contrast stretching to stretch the gray level values of the given image to the full range [0,L-1]. Show the output image after applying the operation. **[6]**

| | | | | | |
|---|---|---|---|---|---|
| 3 | 8 | 2 | 2 | 9 | 4 |
| 8 | 11 | 4 | 11 | 11 | 3 |
| 3 | 10 | 9 | 10 | 3 | 4 |
| 2 | 11 | 9 | 9 | 3 | 2 |
| 4 | 9 | 3 | 8 | 9 | 4 |
| 4 | 8 | 3 | 2 | 11 | 2 |

**b)** Given the following 2x5 *n* bit image with intensity levels *{0,1,...,L-1}* **[6]**

| | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 3 |
| 2 | 4 | 3 | 5 | 2 |

1. Find the smallest possible *n* and the corresponding *L*.
2. Draw histogram and normalized histogram of the image.
3. Perform histogram equalization of the image. Show your calculation. Show the result image and its histogram after applying the equalization.