NATIONAL INSTITUTE OF TECHNOLOGY

WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II MCA, II Semester

MID Examination, February 2018

Sub : Image Processing

Time : 2 Hrs.

Date: 22-02-2018

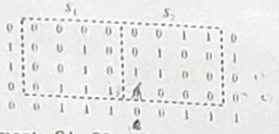
Max. Marks: 30

1) You are preparing a report and have to insert in it an image of size 2048×2048 pixels. 4M

(a) Assuming no limitations on the printer, what would be the resolution per mm have to be for the image to fit in a space of size 5×5 cm?

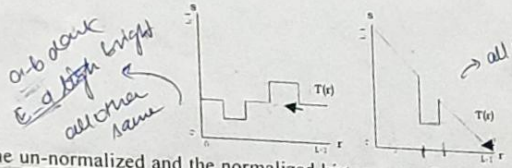
(b) What would the resolution have to be in dpi for the image to fit in 2×2 inches?

2) (a) Consider the two image subsets S1 and S2, shown in the following figure. For V = {0}, determine whether these two subsets are (a) 4-adjacent, (b) 8-adjacent, or (c) m-adjacent. 6M

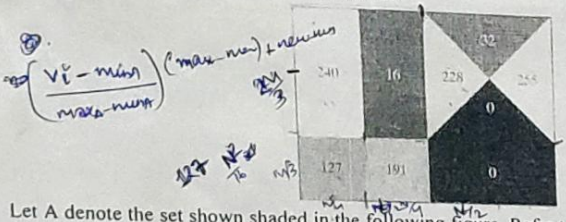


(b) Consider the three image segments S1, S2 and S3. If S1 is m-adjacent to S2 and S2 is m-adjacent to S3. Can we say S1 is m-adjacent to S3? Justify, with an example.

3 What is the difference between the following two types of Intensity-level slicing. What is the type of the images (gray/binary/…) produced by these slicing. What changes we see in the resultant images? 4M

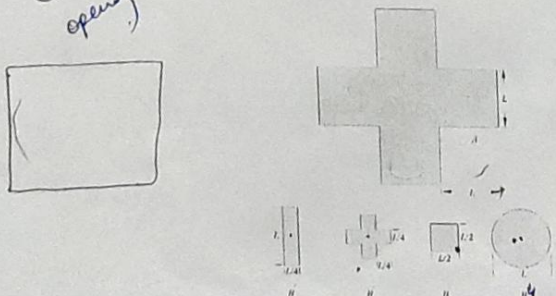


4) Obtain the un-normalized and the normalized histograms of the following 8-bit, M×N image. Give your histogram either in a table or a graph, labeling clearly the value and location of each histogram component in terms of M and N. Double check your answer by making sure that the histogram components add to the correct value 6M



5) Let A denote the set shown shaded in the following figure. Refer to the structuring elements shown (the black dots denote the origin). Sketch the result of the following morphological operations: 4M

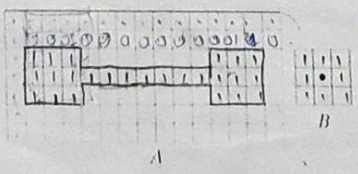
(i) (A⊖B4)⊕B2 (ii) (A⊖B1)⊕B3.



6) Show all intermediate steps of your computations for the following: 6M

(a)Obtain the opening of the figure below using a 3×3 SE of 1s. Do all operations manually.

(b) Repeat (a) for the closing operation



NATIONAL INSTITUTE OF TECHNOLOGY

WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II MCA, II Semester

MID Examination, February 2019

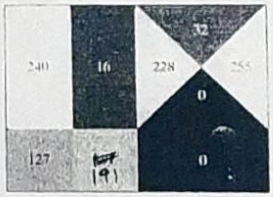
Sub : Image Processing — Date: 28-02-2019

Time : 2 Hrs. — Max. Marks: 30

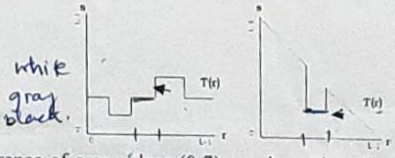
1 Let the following is the subimage, where each pixel is represented with 8-bits. Obtain all the bit plane images of this. 3M

$$\begin{bmatrix} 0 & 1 & 6 \\ 7 & 2 & 4 \\ 6 & 5 & 3 \end{bmatrix}$$

2 Obtain the un-normalized and the normalized histograms of the following 8-bit, M×N image. Give your histogram either in a table or a graph, labeling clearly the value and location of each histogram component in terms of M and N. Double check your answer by making sure that the histogram components add to the correct value 5M



3 What is the difference between the following two types of Intensity-level slicing. What is the type of the images (gray/binary/…) produced by these slicing. What changes we see in the resultant images? 3M



4 An image with the occurrence of gray values (0-7) are shown in column-2 and it is desired to transform the gray value occurrences as shown in column-3. Apply *histogram matching* method and give the final transformed values for the original gray values. 5M

Gray Value (r)	Actual Frequency	Desired Frequency
0	790	512
1	1023	512
2	850	512
3	656	512
4	329	512
5	245	512
6	122	512
7	81	512

5 Consider the image given below. By using LSB watermarking method, embed the data '**NITW**' (text) into two least significant bits of the image. Give the procedure for embedding. Consider the sub image given below, and give the result after embedding the watermark (NITW) into this image. Also give the difference between the original image and watermarked image.(Note: ASCII value of A is 65 and each character need 8-bits) 4M

$$\begin{bmatrix} 5 & 6 & 2 & 13 \\ 8 & 9 & 4 & 3 \\ 6 & 7 & 5 & 9 \\ 6 & 3 & 11 & 12 \end{bmatrix}$$

6 A 1024×1024 8-bit image with 5.3 bits/pixel entropy is to be Huffman coded. 5M

(i) What is the maximum compression that can be expected?

(b) Will it be obtained?

(c) If a greater level of lossless compression is required, what else can be done?

7 Given four symbol source {a,b,c,d} with source probabilities (0.1, 0.4, 0.3, 0.2), arithmetically encode the sequence *bbadcb* 5M

NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
II MCA, II Semester, MID Examination, February 2020
CS6369: Image Processing

Date: 13-02-2020 Time: 2 Hour Max. Marks: 30

→ ***Answer all questions: Each question carries 5 marks.***

1) Consider the four image subsets S1,S2,S3 and S4. Assume V={2,3,4}, Fill the table given based on the adjacency of subsets.

	4-Adjacency				8-Adjacency				m-Adjacency			
	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
S1												
S2												
S3												
S4												

2) Assume that, the image is a gray image with ranges 0 to 255. The size of the image is 256×256. Give a suitable mask so that if we do the (i) AND (ii) OR operation, the resultant image should have only the entire building without the statue. Assume that, the size of the statue is 40×20.

3) An image with the occurrence of gray values (0-7) are shown in column-2. Apply the histogram equalization and give the resultant image gray values. After applying one time, once again apply the histogram equalization for the second pass and then third pass. Give the resultant histogram for all the three passes.

Gray Value	Frequency
0	81
1	122
2	245
3	329
4	656
5	850
6	1023
7	790

4) Some filters can be implemented by the successive application of two simplex filters. For example, the 3×3 averaging filter can be implemented by first applying a 3×1 averaging filter and then applying a 1×3 averaging filter to the result. The 3×3 averaging filter is thus separable in two sampler filter. Based on this,
(i)give the separable filters for the following filters

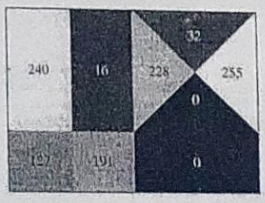
$$\frac{1}{9}\begin{bmatrix}1&1&1\\1&1&1\\1&1&1\end{bmatrix} \quad \begin{bmatrix}1&-2&1\\-2&4&-2\\1&-2&1\end{bmatrix}$$

(a) (b)

$$\begin{bmatrix}a\\b\\c\end{bmatrix}\begin{bmatrix}a & b & c\end{bmatrix}$$

(ii) For an image of size $m \times m$, what is the number of multiplication and additions
(a) For a given $n \times n$ filter (b) If the filter is separable.

5) Obtain the un-normalized and the normalized histograms of the following 8-bit, M×N image. Give your histogram either in a table or a graph, labeling clearly the value and location of each histogram component in terms of M and N. Double check your answer by making sure that the histogram components add to the correct value



6) Let the following is the subimage, where each pixel is represented with 8-bits. Obtain all the bit plane images of this.

$$\begin{bmatrix}0&1&6\\7&2&4\\6&5&3\end{bmatrix}$$

NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
II MCA, II Semester, MID Examination, February 2020
CS6369: Image Processing

Date: 13-02-2020 Time: 2 Hour Max. Marks: 30

→ ***Answer all questions: Each question carries 5 marks.***

1 Consider the four image subsets S1,S2,S3 and S4. Assume V={2,3,4}, Fill the table given based on the adjacency of subsets.

	4-Adjacency				8-Adjacency				m-Adjacency			
	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
S1												
S2												
S3												
S4												

2 Assume that, the image is a gray image with ranges 0 to 255. The size of the image is 256×256. Give a suitable mask so that if we do the (i) AND (ii) OR operation, the resultant image should have only the entire building without the statue. Assume that, the size of the statue is 40×20.

3 An image with the occurrence of gray values (0-7) are shown in column-2. Apply the histogram equalization and give the resultant image gray values. After applying one time, once again apply the histogram equalization for the second pass and then third pass. Give the resultant histogram for all the three passes.

Gray Value	Frequency
0	81
1	122
2	245
3	329
4	656
5	850
6	1023
7	790

4 Some filters can be implemented by the successive application of two simplex filters. For example, the 3×3 averaging filter can be implemented by first applying a 3×1 averaging filter and then applying a 1×3 averaging filter to the result. The 3×3 averaging filter is thus separable in two sampler filter. Based on this,
(i)give the separable filters for the following filters

$$\frac{1}{9}\begin{bmatrix}1&1&1\\1&1&1\\1&1&1\end{bmatrix} \qquad \begin{bmatrix}1&-2&1\\-2&4&-2\\1&-2&1\end{bmatrix}$$

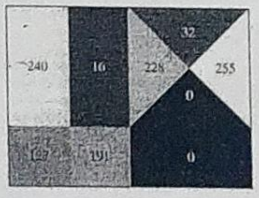
(a) (b)

$\frac{1}{3}\begin{bmatrix}1\\1\\1\end{bmatrix}$ & $\frac{1}{3}[1\ 1\ 1]$

$\begin{bmatrix}1\\-2\\1\end{bmatrix}$ & $[1\ -2\ 1]$

(ii) For an image of size $m \times m$, what is the number of multiplication and additions
(a) For a given $n \times n$ filter (b) If the filter is separable.

5 Obtain the un-normalized and the normalized histograms of the following 8-bit, M×N image. Give your histogram either in a table or a graph, labeling clearly the value and location of each histogram component in terms of M and N. Double check your answer by making sure that the histogram components add to the correct value



6 Let the following is the subimage, where each pixel is represented with 8-bits. Obtain all the bit plane images of this.

$$\begin{bmatrix}0&1&6\\7&2&4\\6&5&3\end{bmatrix}$$

8 bit
3 bit

NATIONAL INSTITUTE OF TECHNOLOGY

WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II MCA, II Semester

END Examination, May 2018

Sub : Image Processing
Time : 3 Hrs.

Date: 04-05-2018
Max. Marks: 50

1. What is Image Resolution? Write all the definitions you know and justify the definition in which context we use it? 5M

2. Let the follwing is the subimage, where each pixel is represented with 8-bits. Obtain all the bit plane images of this. 6M

$$\begin{bmatrix} 0 & 1 & 6 \\ 7 & 2 & 4 \\ 6 & 5 & 3 \end{bmatrix}$$

3. What is morphology? What are the different morphological operations on Binary Images? 6M

4. Obtain the Morphological Gradient for the following gray image. 6M

$$\begin{bmatrix} 2 & 1 & 3 & 6 & 7 & 2 \\ 0 & 2 & 5 & 4 & 7 & 3 \\ 6 & 2 & 5 & 4 & 1 & 6 \\ 3 & 5 & 4 & 1 & 2 & 2 \\ 5 & 4 & 1 & 3 & 6 & 5 \\ 2 & 5 & 4 & 1 & 6 & 3 \end{bmatrix}$$

5. Consider the following color image and intensity distributions. Get the histogram equalized image color image for this. 7M

Value	RED Band	GREEN Band	BLUE Band
0	790	656	245
1	1023	329	122
2	850	245	81
3	656	122	790
4	329	81	1023
5	245	790	850
6	122	1023	656
7	81	850	329

6. What is the method used in Haar forward Wavelet Transform? By using this method give the results after 2-level decomposition of the given image. 7M

$$\begin{bmatrix} 7 & 5 & 9 & 2 & 4 & 8 & 7 & 5 \\ 9 & 6 & 5 & 8 & 7 & 4 & 9 & 5 \\ 4 & 7 & 8 & 9 & 5 & 4 & 7 & 1 \\ 5 & 8 & 7 & 6 & 9 & 7 & 4 & 2 \\ 5 & 8 & 7 & 9 & 5 & 7 & 8 & 6 \\ 5 & 7 & 6 & 8 & 7 & 4 & 9 & 5 \\ 8 & 5 & 8 & 7 & 4 & 2 & 8 & 7 \\ 9 & 5 & 7 & 8 & 4 & 5 & 8 & 3 \end{bmatrix}$$

7(a) What is Digital Watermarking? What are the applications of this. 7M

(b) What is visible watermarking and invisible watermark? Give the procedure how to do these two techniques on a image.

8. Use LZW compression technique and give the result for the following image. 6M

$$\begin{bmatrix} 39 & 39 & 126 & 126 \\ 39 & 39 & 126 & 126 \\ 39 & 39 & 126 & 126 \\ 39 & 39 & 126 & 126 \end{bmatrix}$$

NATIONAL INSTITUTE OF TECHNOLOGY

WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II MCA, II Semester

END Examination, May 2019

Sub : Image Processing
Time : 3 Hrs.

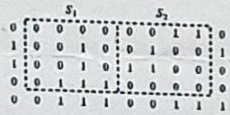
Date: 09-05-2019
Max. Marks: 50

1 You are preparing a report and have to insert in it an image of size 4096×4096 pixels. 4M
(a) Assuming no limitations on the printer, what would be the resolution per mm have to be for the image to fit in a space of size 5×5 cm?
(b) What would the resolution have to be in dpi for the image to fit in 2×2 inches?

2 Consider the image segment shown below. Let V={1,2,3,4,5,6,7,8}. Compute the lengths of the shortest 8-path between *a* and *b*. 3M

1	2	3	4	5	6	[7]	8
2	3	4	5	6	7	8	1
3	4	5	6	7	8	1	2
4	5	6	7	8	1	2	3
5	6	7	8	1	2	3	4
6	7	8	1	2	3	4	5
7	8	1	2	3	4	5	6
8	[1]	2	3	4	5	6	7

3 Consider the two image subsets S1 and S2, shown in the following figure. For V = {0}, determine whether these two subsets are (a) 4-adjacent, (b) 8-adjacent, or (c) m-adjacent. 3M



4 Assume that, the image (a) is a gray image with ranges 0 to 255. The size of the image is 256×256. Give a suitable mask so that if we do the AND operation, the resultant image should have only the entire building without the statue. Assume that, the size of the statue is 40×20. 4M

5 Consider the following color image and intensity distributions. Get the histogram equalized image color image for this. 7M

Value	RED Band	GREEN Band	BLUE Band
0	790	656	245
1	1023	329	122
2	850	245	81
3	656	122	790
4	329	81	1023
5	245	790	850
6	122	1023	656
7	81	850	329

6 What is the difference between Image Enhancement and Image Restoration 2M

7 If an image with *n* gray values, and the probability of each values is same, what is the entropy of that image. 4M

NATIONAL INSTITUTE OF TECHNOLOGY

WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II MCA, II Semester

I Minor Examination, February 2018

Sub : Image Processing — Date: 15-02-2018

Time : 1 Hr. — Max. Marks: 10

1 Out of the three distances: Euclidian, City-block and Chessboard distances, for a given distance 'n', which one deals with more number of pixels. city block ½

2 If an image is formed via transmission of illumination through X-ray, then the value at f(x,y) is a product of illumination at (x,y) and ---------- reflectance ½

3 If the size of the image formed in retina is 5 mm, and the original size is 20 m, what is the distance between the object and the eye in cms? ½

$\frac{20}{h} = \frac{5}{17}$ $\frac{2000}{d} = \frac{0.5}{1.7}$

4 Monotonic transformation performs a ½
(choose all the possible answer(s))
(a) one-to-one mapping
(b) many-to-one mapping
(c) one-to-many mapping
(d) many-to-many mapping

subjective objective

5 What is the difference between Image Enhancement and Image Restoration? ½

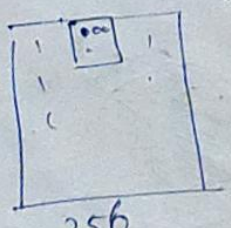
6 Quantization refers to ½
(a) Testing the possible positions of an object in an image.
(b) Discretization of the values an image pixel can take.
(c) Inversion of the pixel values.
(d) Discretization of the spatial image domain.

7 Consider the image segment shown below. Let V={1,2,3,4,5,6,7,8}. Compute the lengths of the shortest 8-path between *a* and *b*. 1

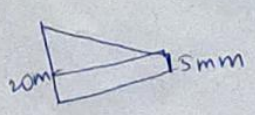
1	2	3	4	5	6	[7]	8
2	3	4	5	6	7	8	1
3	4	5	6	7	8	1	2
4	5	6	7	8	1	2	3
5	6	7	8	1	2	3	4
6	7	8	1	2	3	4	5
7	8	1	2	3	4	5	6
[8]	1	2	3	4	5	6	7

$\max = [(7-2), (8-1)]$
$= \max(5, 7)$
$= 7$

8 Assume that, the image (a) is a gray image with ranges 0 to 255. The size of the image is 256×256. Give a suitable mask so that if we do the AND operation, the resultant image should have only the entire building without the statue. Assume that, the size of the statue is 40×20. 1



$x \times 1 = x$
$x \times 0 = 0$



$\frac{256}{2} = \frac{128}{}$

R - C

NATIONAL INSTITUTE OF TECHNOLOGY

WARANGAL – 506 004

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II MCA, II Semester

MID Examination, February 2019

Sub : Image Processing — Date: 28-02-2019

Time : 2 Hrs. — Max. Marks: 30

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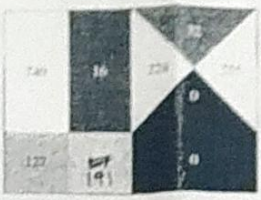
$$\begin{bmatrix} 0 & 1 & 6 \\ 7 & 2 & 4 \\ 6 & 5 & 3 \end{bmatrix}$$

2 Obtain the un-normalized and the normalized histograms of the following 8-bit, M×N image. Give your histogram either in a table or a graph, labeling clearly the value and location of each histogram component in terms of M and N. Double check your answer by making sure that the histogram components add to the correct value 5M



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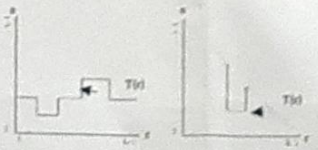

4 An image with the occurrence of gray values (0-7) are shown in column-2 and it is desired to transform the gray value occurrences as shown in column-3. Apply *histogram matching* method and give the final transformed values for the original gray values. 5M

Gray Value (r)	Actual Frequency	Desired Frequency
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$$\begin{bmatrix} 5 & 6 & 2 & 13 \\ 8 & 9 & 4 & 3 \\ 6 & 7 & 5 & 9 \\ 6 & 3 & 11 & 12 \end{bmatrix}$$

6 A 1024×1024 8-bit image with 5.3 bits/pixel entropy is to be Huffman coded. 5M

(i) What is the maximum compression that can be expected?

(b)Will it be obtained?

(c) If a greater level of lossless compression is required, what else can be done?

7 Given four symbol source {a,b,c,d} with source probabilities (0.1, 0.4, 0.3, 0.2), arithmetically encode the sequence *bbadeb* 5M