DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
ONLINE SESSIONAL EXAMINATION

B.Tech (CE) sem : 7

Subject : Image Processing

Roll No. : CE-129 Date : 25/08/2020

Signature : Siddhu Time : 10:00 am to 11:15 am

Total Pages : 13

Q. : 2

Q. : 2 - a)

1	7	5
6	(2)	3
1	4	2

$m \times n = 3 \times 3 = 9$

1) Arithmetic Mean :-

$$f(x,y) = \frac{1}{mn} \sum_{(s,t) \in S_{xy}} g(s,t)$$

$$= \frac{1}{9} (31)$$

$= 3.44$

≈ 3

2) Geometric Mean

$$f(x,y) = \left[\prod_{(s,t) \in} g(s,t) \right]^{1/mn}$$

$= [10080]^{1/9}$

$= 2.78$

≈ 3

3) 3×3 Harmonic mean

$$f(x,y) = \frac{mn}{\sum_{(s,t) \in S_{xy}} \frac{1}{g(s,t)}}$$

$$= \frac{9}{1 + \frac{1}{7} + \frac{1}{5} + \frac{1}{6} + \frac{1}{2} + \frac{1}{3} + 1 + \frac{1}{4} + \frac{1}{2}}$$

$= 2.19$

≈ 2

4) 3×3 Mead point filter :-

$$f(x,y) = \frac{1}{2}\left\{ \max_{(s,t)\in S_{xy}}\{g(s,t)\} + \min_{(s,t)\in S_{xy}}\{g(s,t)\} \right\}$$

$$= \frac{1}{2}\{7 + 1\}$$

$$= 4$$

5) 3×3 Median Filter :-

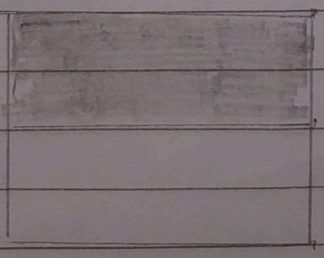
$$f(x,y) = \text{median}_{(s,t)\in S_{xy}}\{g(s,t)\}$$

1 1 2 2 3 4 5 6 7

$$= 3$$

Q.:2 b)

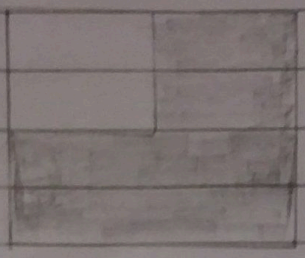
1) NOT (Image 1)



In Not operation 1 becomes zero and 0 becomes 1.

So that, black region becomes white and white regions becomes zero.

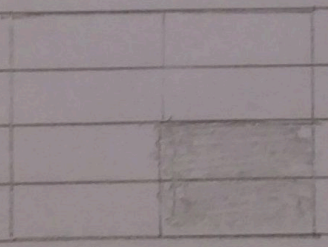
2) AND (Image 1, Image 2)



Only AND of 1 and 1 is equal to 1. all others are zero.

So that, If both are white regions then and only then in output image its white.

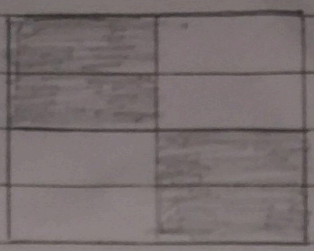
3) OR (Image 1, Image 2)



In ~~or~~ OR if one is one then its output is one.

So, In output If both pixels are 0 then and only then it is black.

4) XOR (Image 1, Image 2)



inputs	output of xor
0 0	0
0 1	1
1 0	1
1 1	0

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Q. :1

(d) dist = 300m
height = 40 m.

$$\frac{40}{300} = \frac{h}{17}$$

$$\therefore h = 2.27 \text{ mm}$$

(e) Alpha trimmed mean filter :-

$$f(x,y) = \frac{1}{mn-d} \sum_{(s,t) \in S_{xy}} g_r(s,t)$$

- Delete lowest $d/2$ and highest $d/2$ gray level pixel.
- If $d=0$ than it is arithmetic mean filter
- If $d = mn-1$ than it is median filter
- It is used on where multiple noise in image. like combination of Gaussian and salt and pepper noise

(f) Photopic vision :

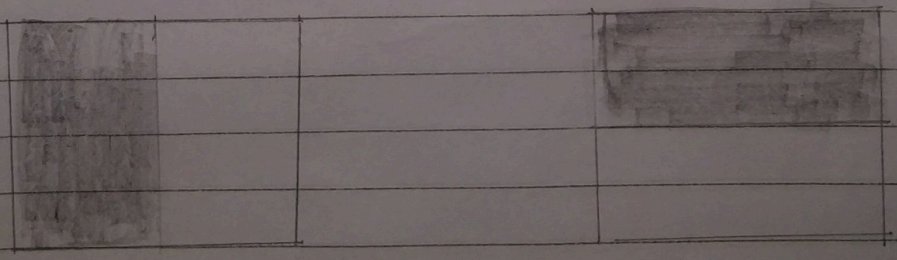
- The vision of the eye under well lit conditions
- It allows color preceptions which is mediated by cone cells.
- Cone vision is called "photopic"

Scotopic vision :

- Vision of eye under low conditions.
- Not involved in color vision and are senitive to low level illumination.
- It is called scotopic vision.

(b) yes, two different image have same histogram b.

Because histogram is ~~a plot~~ the plot of the number of pixels have that gray level.



a b

(c)

$$m = \sum_{i=0}^{L-1} r_i p(r_i)$$

$$= 0\left(\frac{7}{25}\right) + 1\left(\frac{6}{25}\right) + 2\left(\frac{5}{25}\right) + 3\left(\frac{7}{25}\right)$$

$$= \boxed{1.44}$$

(a)

8th bit plane.

1	1	1	1
1	1	1	1
0	0	0	0
0	0	0	0

1st bit plane

1	0	1	0
0	1	0	1
0	1	0	1
1	0	1	0

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Q.:-3

Q.:-3 (a)

a)

Smallest possible $n = 0$

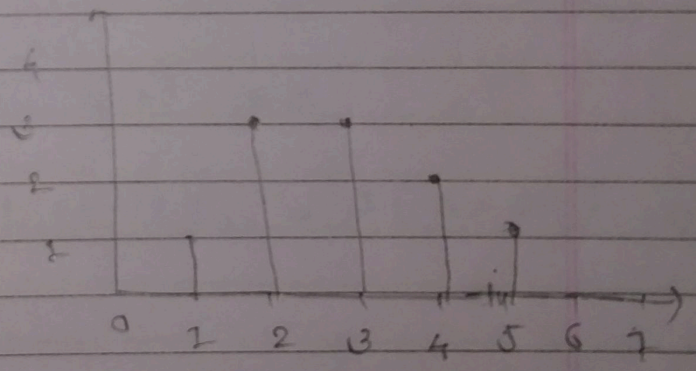
$$L = 2^k = 2^k = 2^3 = 8$$

b)

Frequency of each pixe

0 - 0
1 - 1
2 - 3
3 - 3
4 - 2
5 - 1
6 - 0
7 - 0

Histogram



Normalized Histogram

$P_0(0) = \frac{0}{10} = 0$

$P_1(1) = 0.1$

$P_2 = 0.3$

$P_3 = 0.3$

$P_4 = 0.2$

$P_5 = 0.1$

$P_6 = 0$, $P_7 = 0$

r_k	n_k	$P_{r_k}(r_k) = n_k/n$
0	0	0
1	1	0.1
2	3	0.3
3	3	0.3
4	2	0.2
5	1	0.1
6	0	0
7	0	0

$$S_k = (L-1) \sum_{j=0}^{k} P_{r_j}(r_j) \qquad L = 8$$

$$S_0 = (L-1) P_0 = 7(0) = 0$$

$$S_1 = (L-1) P_0 + (L-1) P_1 = 7(0 + 0.1) = 0.7$$

$$S_2 = 2.8$$

$$S_3 = 4.9$$

$$S_4 = 6.3$$

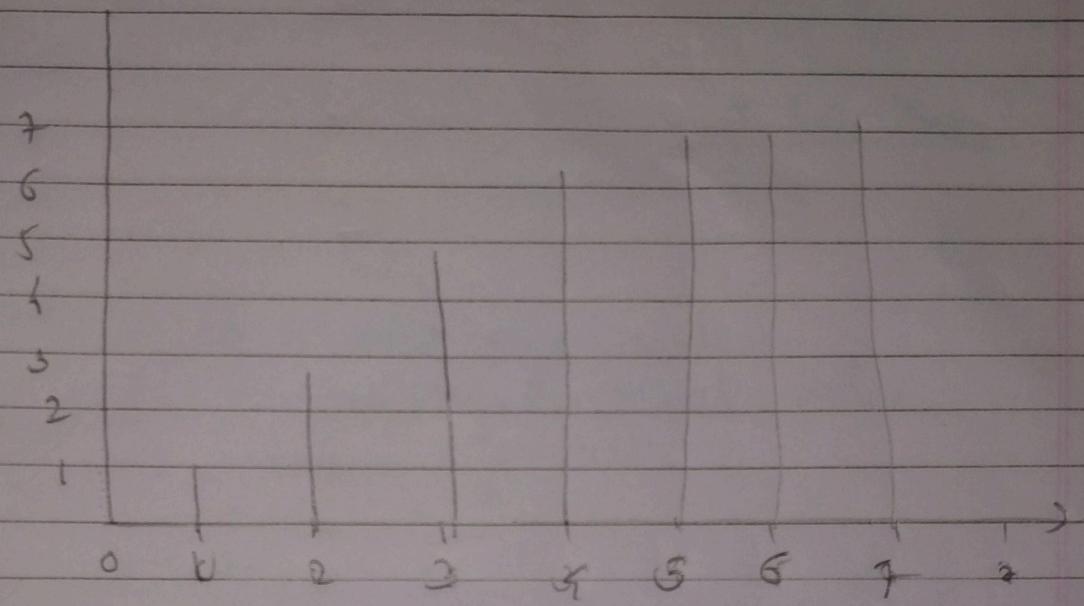
$$S_5 = 7$$

$$S_6 = 7$$

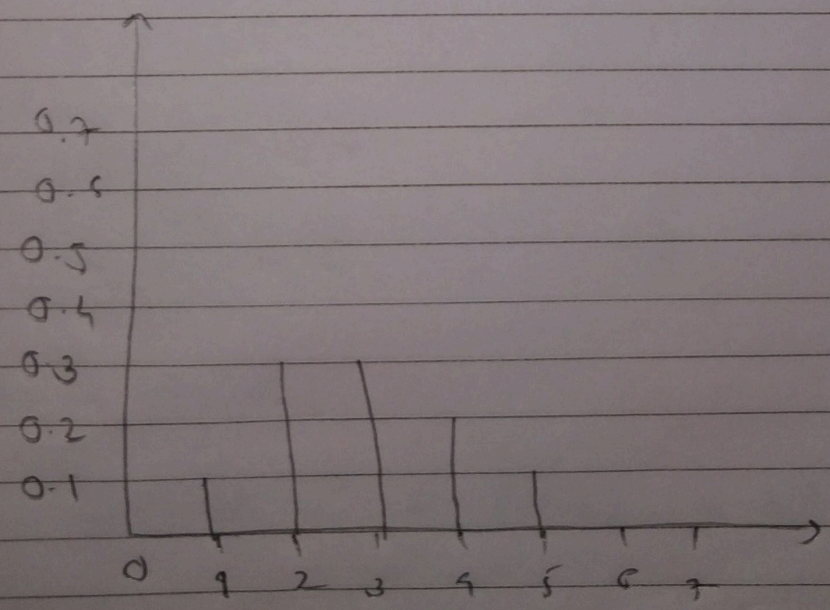
$$S_7 = 7$$

(d)

Histogram equalization :-



Histogram Normalization :-



Q.1-3 c)

Contrast streching

$$n' = \left(\frac{s_{max} - s_{min}}{r_{max} - r_{min}} * (n - r_{min}) \right) + s_{min}$$

n' = new pixel value
n = current pixel value
$s_{max} = 2^4 - 1 = 15$
$s_{min} = 0$
$r_{max} = 11$
$r_{min} = 2$

So $n' = \frac{15}{9}(n-2)$

for $n = 3$

$$n' = \frac{5}{3}(3-2) = \frac{5}{3}$$

for $n = 8$

$$n' = \frac{5}{3}(8-2) = 10$$

for $n = 2 = \frac{5}{3}(2-2)$ ad

for $n = 9$

$$n' = \frac{5}{3}(9-2) = \frac{35}{3}$$

for $n = 4$

$$n' = \frac{5}{3}(4-2) = \frac{10}{3}$$

for $n = 10$

$$n' = \frac{5}{3}(10-2) = \frac{40}{3}$$

Output Image using contrast strechizg

5/3	10	0	0	35/3	10/3
10	15	10/3	15	15	5/3
5/3	10/3	35/3	40/3	5/3	10/3
0	15	35/3	35/3	5/3	0
10/3	35/3	5/3	10	35/3	10/3
10/3	10	5/3	15	15	0