MIDTERM - IMAGE PROCESSING (2017-18, II)

TIME: 90 minutes **Maximum Marks: 30**

Q1. Consider image (a). Give the structuring element (along with origin) and morphological operation that produces image (b). The dashed lines show boundary of original set and are included only for reference. (2*2=4)

a)  b) 

Q2. Consider the following image having 16 gray levels:

5	6	7
8	6	7
12	14	8

a) Show the negative of the image. (3)

b) Draw the transformation function which assigns intensity value 12 to all input intensities in the range 5-10 and an intensity value 2 otherwise. (3)

Q3. Consider the intensity set V = {1,4,5}. Compute the *m*-adjacent path distance from *p* to *q* for the image I = [3, 3, 1, 5(*q*); 2, 2, 4, 6; 2, 1, 5, 5; 4(*p*), 5, 6, 7]. Show the path also. (5)

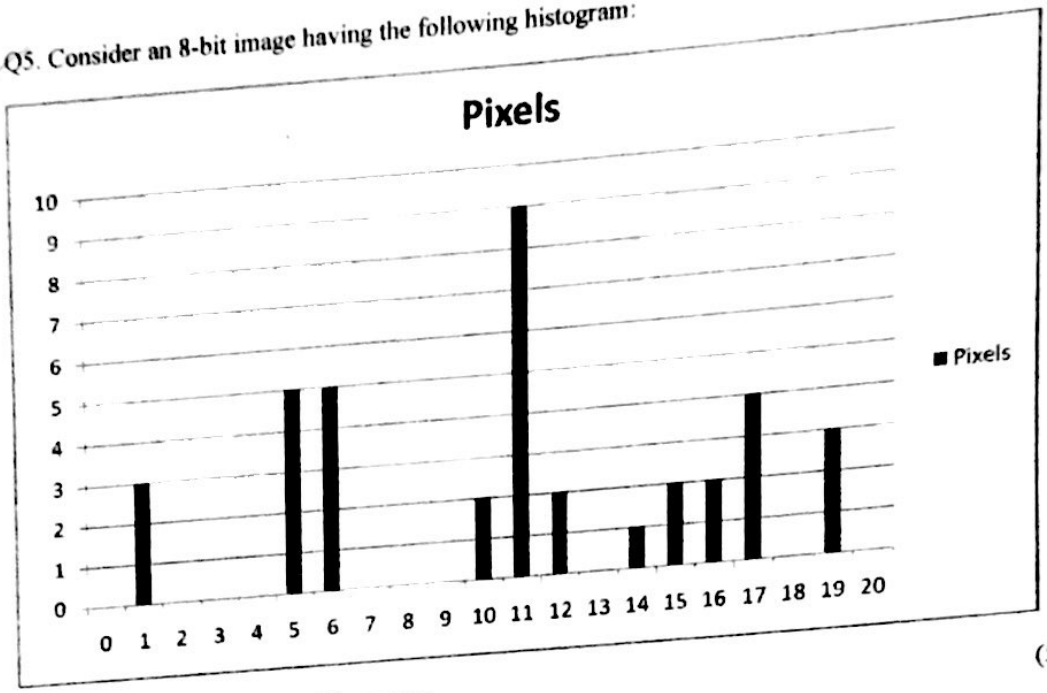
Q4. Consider the following image: (5)

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

Apply the following Laplacian operator on the image and show the resultant. Apply zero padding for boundary pixels.

0	1	0
1	-4	1
0	1	0

Q5. Consider an 8-bit image having the following histogram:



(5)

a) Normalize the histogram of the image.

b) Consider that the least significant bit for each pixel in the image is set to zero. Show the histogram of the new image. (5)

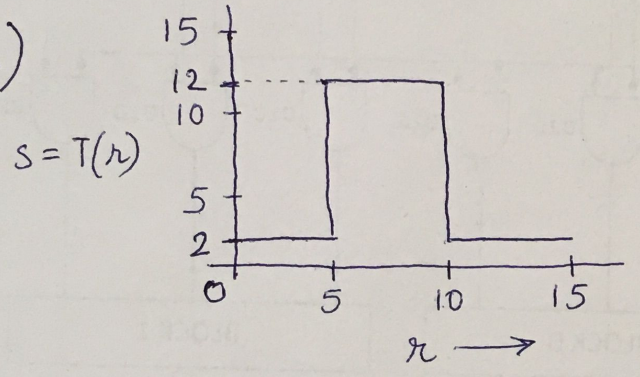
1. Structuring element :

Morphological operation : Erosion

2. a) Negative of the image :

10	9	8
7	9	8
3	1	7

b)



3.

3 3 1 → 5 (q)
↑
2 2 4 6
↑
2 1 → 5 5
↑
4 → 5 6 7
(P)

$V = \{1, 4, 5\}$

4. Resultant image :

2	-1	-1	-4	-14
0	3	1	0	-8
-3	-1	6	0	-8
-5	0	-2	2	-8
-16	-9	-9	-11	-11

5.

b) If LSB for each pixel is set to 0, t
will be no odd intensities, only even or

r_k	n_k	s_k (LSB = 0)
0	0	0
1	3	0
2	0	2
3	0	2
4	0	4
5	5	4
6	5	6
7	0	6
8	0	8
9	0	8
10	2	10
11	9	10
12	2	12
13	0	12
14	1	14
15	2	14
16	2	16
17	4	16
18	0	18
19	3	18
20	0	20

s_k	n_k
0	3
1	0
2	0
3	0
4	5
5	0
6	5
7	0
8	0
9	0
10	11
11	0
12	2
13	0
14	3
15	0
16	6
17	0
18	3
19	0
20	0

Total no. of pixels = n = 38

r_k	n_k	$p_r(r_k) = n_k/n$	Cdf = s_k	$s_k * 20$
0	0	0	0	0
1	3	0.08	0.08	2
2	0	0	0.08	2
3	0	0	0.08	2
4	0	0	0.08	2
5	5	0.13	0.21	4
6	5	0.13	0.34	7
7	0	0	0.34	7
8	0	0	0.34	7
9	0	0	0.34	7
10	2	0.05	0.39	8
11	9	0.24	0.63	13
12	2	0.05	0.68	14
13	0	0	0.68	14
14	1	0.03	0.71	14
15	2	0.05	0.76	15
16	2	0.05	0.81	16
17	4	0.11	0.92	18
18	0	0	0.92	18
19	3	0.08	1.00	20
20	0	0	1.00	20

s_k	n_k
0	0
1	0
2	3
3	0
4	5
5	0
6	0
7	5
8	2
9	0
10	0
11	0
12	0
13	1
14	3
15	2
16	2
17	0
18	4
19	0
20	3