COURSE:	DIGITAL IMAGE PROCESSING
SECTION:	EE 410-01 (052)
INSTRUCTOR:	DR. OMAR A. AL-SUWAILEM
TEST:	First Test
DATE:	March 15th, 2005 (10:30 AM)
PLACE:	BLDG 9-242

STUDENT NAME:

STUDENT ID #:

Question #	Points	Grade
1	20	
2	30	
3	20	
4	15	
5	15	
TOTAL	**100**	

INSTRUCTIONS:
Relax, Relax, Relax….
Understand the question before you answer

- Solve all the given problems.
- Show all your work and steps.
- Closed books and notes.
- Be neat and organized in your solutions.

***Question 1* [*20 points*]**
For this question: Correct Answer = 2.0 point, No Answer = 0.0 point, Wrong Answer = -1 point.

Select the most appropriate term from the following in the given statements (some terms may be used more than once):

bit-plane slicing
laplacian
false countering effects,
log transformation,
spatial resolution,
point processing
image averaging,
checkerboard effects,
median filtering,
masking,
smoothing,
sharpening,
gray level resolution,

(1) To use _____ method, we assume that we are able to get or have more images for the same scene so that the variability of pixel values at each location can be reduced.
(2) We may consider the process of _____ an image to be analogous to a differentiation operation.
(3)_____ of a digital image is refers to the number of pixels in the horizontal and vertical details, while _____ refers to the number of gray levels.
(4) Compressing the gray level scale of an image can be achieved using _____technique.
(5) The _____has a stronger response to isolated points than the first derivative.
(6) _____is due to reduction in the number of gray levels in the image.
(7) _____is very useful and effective in reducing the effects of salt and pepper noise.
(8) The _____ can be used for sharpening images.
(9) Finding the negative of an image is a form of _____.

***Question 2* [*30 points*]**

(a) Give a general expression for the blurring size of $n \times n$ smoothing mask when applied to a rectangular shape of size $i \times j$ pixels in the middle of an image, i.e. assume that this shape is not near the borders of the image.

(b) Discuss the difference in the results of using a smoothing filter at the boarders of an image by comparing the case when the boarder is padded by zeros and the case of duplicating the required rows and columns.

(c) Scaling in image subtraction:

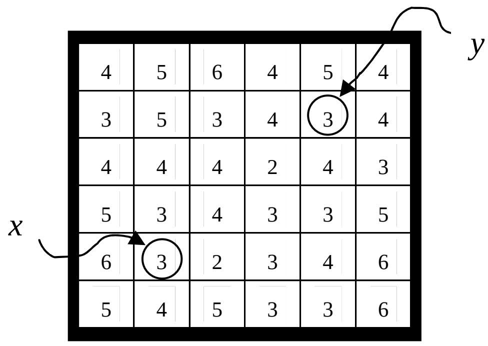
(i)Two image of a gray level scale [0, 127] were subtracted from each other. What is the minimum and maximum range of the resulting image?

(ii) how can you scale the result of part (i) to fit the original range of [0,127].

(iii) Suppose that the range of the resulting difference image was [-50, 100], what would be a better scaling method?

***Question 3* [*20 points*]**

(a) *Consider the image shown and let* V={3,4}, *compute the lengths of the shortest* 4-, 8-, *and m-path between y and x. Show your work and fill in the table.*



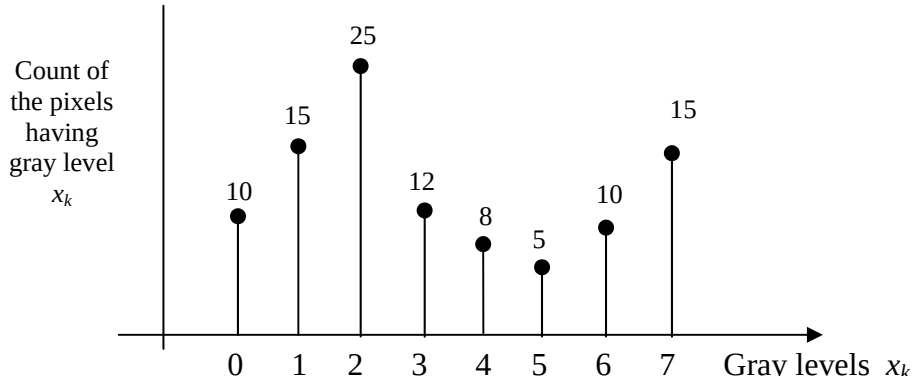
4	5	6	4	5	4
3	5	3	4	3	4
4	4	4	2	4	3
5	3	4	3	3	5
6	3	2	3	4	6
5	4	5	3	3	6

4	5	6	4	5	4
3	5	3	4	3	4
4	4	4	2	4	3
5	3	4	3	3	5
6	3	2	3	4	6
5	4	5	3	3	6

4	5	6	4	5	4
3	5	3	4	3	4
4	4	4	2	4	3
5	3	4	3	3	5
6	3	2	3	4	6
5	4	5	3	3	6

	4-path	8-path	*m*-path
Does it exist?			
Length:			
Is it unique?			

***Question 4* [*15 points*]**
The histogram of an image that has a gray scale [0-7] is as given below:



(a) Suppose this histogram represents a square image. What would be its size in pixels?

(b) Compute the time (in seconds) that is required for transmitting this image over a channel capable of sending 9600 bits/sec considering the following two cases:

(d) Repeat part (b) If the image pixel values are represented as binary, i.e, two levels.

(e) What is the effect on the histogram shape if we add 1 to each gray level in this image?

***Question 5* [*15 points*]**

(a) *Discuss the effects (in terms of new gray level strength, blurring effects, etc.) of applying the following* 3×3 *masks on an image having a single isolated noise point, as sh*own:

Mask 1

$\frac{1}{9}\times$

1	1	1
1	1	1
1	1	1

Mask 2

$\frac{1}{16}\times$

1	2	1
2	4	2
1	2	1

Mask 3

0	1	0
1	-4	1
0	1	0

Original Image

0	0	10	10	10
0	0	10	10	10
0	0	10	10	10
0	0	10	10	10
0	0	10	10	10

Result of Mask 1

Result of Mask 2

Result of Mask 3
