جامعة بيروت العربية
BEIRUT ARAB UNIVERSITY

Homework -1

Submission date: March 9th, 2025

Prepared by Ali El-Zaart

Semester: .....Spring2015..... **2024 / 2025**.....

Faculty : Science.....

Department : Maths and Computer Science..... **Program**: CS.....

Course Name : Applied AI **Course Code**: CMPS472…-Debbieh…

Student's Name: ……	**ID:** .....
Section/ Group:	**Seat Number:** .....

INSTRUCTIONS:

1- Any kind of cheating will subject the student to the penalties specified by the University rules

2- Use of cell phone is strictly prohibited

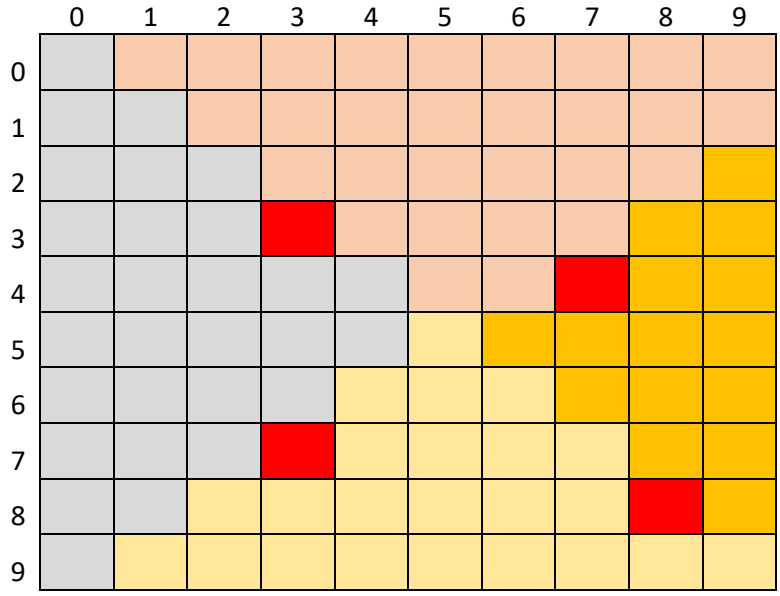
Question	Mark	Out of
One		**16**
Two		**12**
Three		**12**
Four		**10**
Five		**10**
Six	-	
Seven	-	
Eight	-	
Nine	-	
Ten	-	-
Total		**50**

Total marks in letters

Examiner's Name: ..... **Ali El-Zaart**.....

Signature: .....

We are working with an I(x,y) image of size 10x10 and will apply different image processing techniques. HW1 includes questions for all students, and each student has been assigned a specific image. Please check the Excel sheet to find your designated image. For instance, the image for the student with ID 202402983 is I23.txt.



For each question, show all steps of your results.

Question-1: Image Enhancement

(a) Apply the image negative algorithm at the four pixels (3,3), (4,7), (7,3), and (8,8)
Answer:

Negative image at (3,3) =

Negative image at (4,7) =

Negative image at (7,3) =

Negative image at (8,8) =

(b) Apply the image log transform algorithm at the four pixels (3,3), (4,7), (7,3), and (8,8)

log transform image at (3,3) =

log transform image at (4,7) =

log transform image at (7,3) =

log transform image at (8,8) =

(c) Apply the image inverse log transform algorithm at the four pixels (3,3), (4,7), (7,3), and (8,8)

Inverse-log transform image at (3,3) =

Inverse-log transform image at (4,7) =

Inverse-log transform image at (7,3) =

Inverse-log transform image at (8,8) =

(d) Apply the image power-law transform algorithm at the four pixels (3,3), (4,7), (7,3), and (8,8)

power-law transform image at (3,3) with gamma=0.5 =

power-law transform image at (4,7) with gamma=0.5 =

power-law transform image at (7,3) with gamma=1.5 =

power-law transform image at (8,8) with gamma=1.5 =

Question-2: Mean Filters

(a) Apply the 3x3 arithmetic mean filter at the two pixels (4,1) and (4,7):

(b) Apply the 3x3 Geometric 3x3 mean filter at the two pixels (4,1) and (4,7):

(c) Apply the 3x3 Harmonic mean filter at the two pixels (4,1) and (4,7):

(d) Apply the 3x3 Contra-Harmonic mean filter at the two pixels (4,1) and (4,7):

For Q=- 1

For Q=0

For Q=+1

Question-3: Order statistics Filters

(a) Apply the 3x3 median filter algorithm at the two pixels (4,1) and (4,7):

(b) Apply the 3x3 max and min filter algorithms at the two pixels (4,1) and (4,7):

(c) Apply the 3x3 midpoint filter algorithm at the two pixels (4,1) and (4,7):

(d) Apply the 3x3 Alpha-Trimmed mean filter algorithm at the two pixels (4,1) and (4,7):

For d=1

For d=2

For d=4

Question-4: Edge Detection

(a) Apply the gradient algorithm at the pixel (5,5) using Sobel Masks Max and My:
Hints: Compute Gx, Gy, and then the gradient G(x,y)

(e) Apply line detection algorithm at a pixel (3,3) and (4,7) using four Masks:

(b) Apply point detection algorithm at a pixel (3,3) and (4,7) using Laplacian Mask:

Question-5: Image Thresholding

(a) Compute the histogram of the image

(b) Apply the Otsu method on the image in order to compute the optimal threshold, (compute the new value of threshold, show only one iteration), where T0= (min+max)/2, where min= minimum of the image and max= maximum od the image.

End of Homework