C/h 12380

UNIVERSITI MALAYSIA TERENGGANU

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FINAL EXAMINATION

SEMESTER I 2015/2016 SESSION (DEGREE PROGRAMME)

COURSE NAME	:	**GRAPHICS COMPUTING AND DIGITAL IMAGE PROCESSING**
COURSE CODE	:	**CSA4701**
DATE	:	**10 JANUARY 2016 (SUNDAY)**
VENUE	:	**DSM**
TIME	:	**12.00 – 2.00 PM (2 HOURS)**

STUDENT NO.	:	_____
PROGRAMME	:	_____
SEAT NO.	:	_____

INSTRUCTIONS TO CANDIDATES

i. This paper consists **TWO (2)** parts:
PART A : Structure Questions (70 Marks)
PART B : Essay Questions (30 Marks)
ii. Read the instructions before answering the questions.
iii. All answers must be written in answer booklet provided.

DO NOT OPEN THE QUESTION PAPER UNTIL INSTRUCTED

THIS QUESTION PAPER CONSISTS OF 6 PRINTED PAGES

PART A: STRUCTURE QUESTIONS [70 Marks]

*This section consists of **FOUR (4)** questions. Answer **ALL** questions.*

1. State and explain any **FOUR (4)** of the applications in Computer Graphics.

[20 Marks]

[PLO1, CLO1, C1 & C2]

2. Given $(a_x, b_x, c_x, d_x) = (1,2,3,4)$ and $\delta=0.1$, calculate the next **THREE (3)** positions of x-coordinate using forward difference calculation. For simplicity, the equations are given in Table 1.

Table 1

$\Delta x_{k+1} = \Delta x_k + \Delta_2 x_k$	$\Delta_2 x_k = 6a_x\delta^2 u_k + 6a_x\delta^3 + 2a_x\delta^2$
$\Delta_2 x_{k+1} = \Delta_2 x_k + \Delta_3 x_k$	$\Delta_3 x_k = 6a_x\delta^3$
$x_0 = d_x$	$\Delta x_0 = a_x\delta^3 + b_x\delta^2 + c_x\delta$
$\Delta_2 x_k = 6a_x\delta^3 + 2b_x\delta^2$	

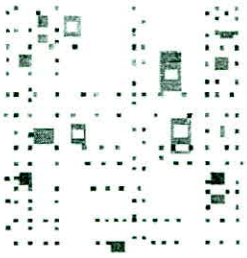
[8 Marks]

[PLO1, CLO1, C3]

3. Shown below in Figure 1(a) is a gray level image derived from the painting "Broadway Boogie Woogie" by Piet Mondrian. In Figs. 1b-1e are shown the gray level dilation, erosion, opening and closing of Figure 1(a). Decide which figure corresponds to which gray level morphology operation. Justify your choices by mentioning what features of each of the images led you to make the choices you did.

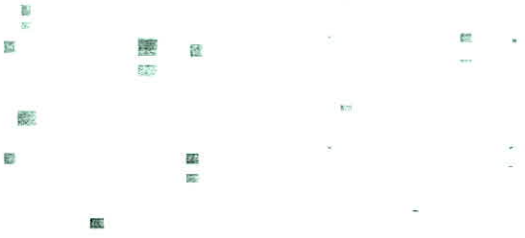
[20 Marks]

[PLO1, CLO1, C4]

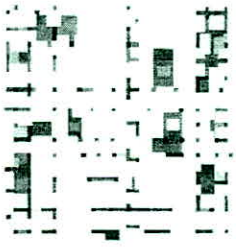


(a)

(b)



(c) (d)



(e)

Figure 1

4. Consider the 256 x 256 image in Figure 2.

[20 Marks]

Figure 2

a) What would happen to the image if:
   i. All the pixels in the image are multiplied by 2.
   ii. All the pixels in the image are divided by 2.

[4 Marks]

[PLO1, CLO1, C5]

b) Explain how you can extract the nose of the cat from the image by using:
   i. AND operation
   ii. OR operation

[4 Marks]

[PLO1, CLO1, C2]

c) Due to some unknown reasons, your cute cat image above has been contaminated with salt-and-pepper noise. You vaguely remember that your lecturer said something about the noise could be removed using a median filter. Since you are not sure, you would like to test whether median filtering can actually remove the salt-and-pepper noise. Assume that you have this extract from the cat image above:

26	25	27	30	28	29
33	23	32	35	190	29
26	26	9	33	32	31
34	200	35	30	29	28
30	35	32	34	32	33

i. Circle the pixels that you think have been contaminated by the noise.
[3 Marks]
[PLO1, CLO1, C4]

ii. Apply median filtering using a neighborhood of size 3 x 3. To make your life easier, apply filter ONLY to the pixels that you have circled above. DO NOT apply filtering to all pixels.
[6 Marks]
[PLO1, CLO1, C3]

iii. Does the noise get eliminated? Give **one** reason for your answer?
[5 Marks]
[PLO1, CLO1, C4]

PART B: ESSAY QUESTIONS **[30 Marks]**

*This section consists of **ONE(1)** question only. Refer to the Figure 3 below.*

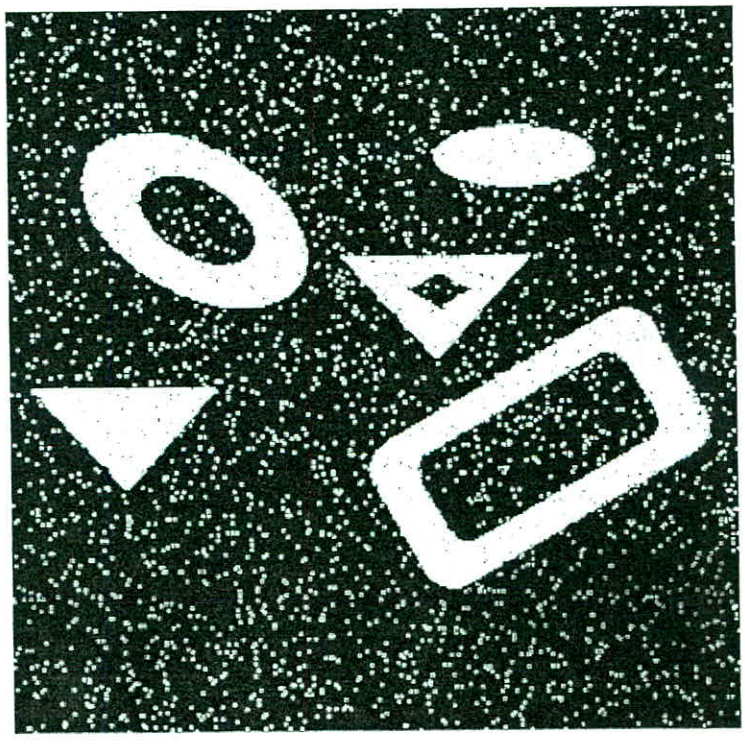


Figure 3

You have the job of designing an algorithm that will count the number of objects with holes and the number of objects without holes in images of the kind shown here. Assume that the images are binary with 0 corresponding to black and 1 corresponding to white. The imaging system is of low quality and produces images that are corrupted with salt and pepper noise. The objects do not overlap or touch, but may be close to each other in any direction. They may be of any shape or size. The algorithm should not be confused by the salt and pepper noise, and should not count noise pixels as objects. Write a pseudo-code description of your algorithm. You may also include a block diagram and other information to make it understandable to a programmer. State any assumptions you make, such as: "Objects must contain at least 50 pixels."

[PLO3, CLO3, C3 & C5]

- END OF QUESTION PAPER –