Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science and Technology
300 level 2nd Semester Examination – Dec. 2018 / Jan. 2019
CST 382-3 Digital Image Processing

Uva Wellassa University

Instructions to candidates
Duration: Three (03) hours
Number of questions: 1 Structured and 5 Essays
Mark allocation: 100 mark
Answer all questions and attach the question paper with answer script.

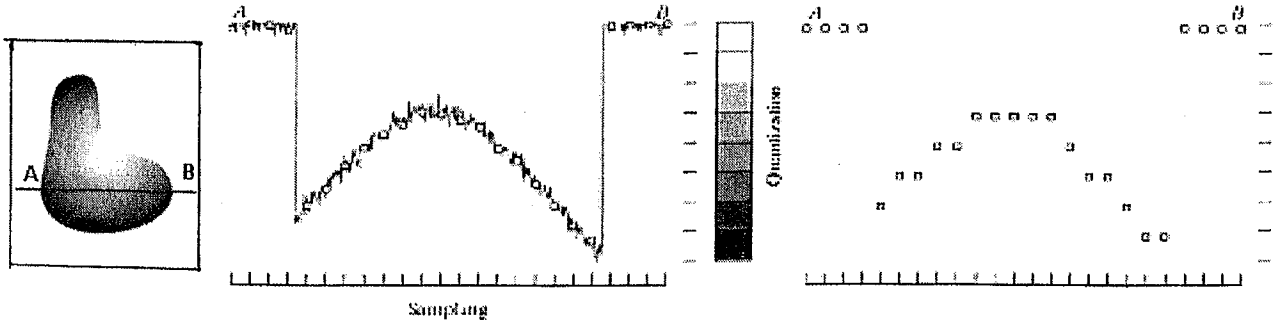
Part B

1.

a. Define the term **digital image** in your own words. (2 mark)
b. List five (05) applications of Digital Image Processing. (2.5 mark)
c. What are the basic components comprising a General-purpose Image Processing System? (3 mark)
d. Briefly explain the three (03) levels of image processing by providing suitable examples. (5 mark)
e. Briefly describe the key stages of Digital Image Processing. (6 mark)

2.

a. What is the **resolution** of a digital image and how it affects the image interpretation? (2.5 mark)
b. List three (03) principle imaging sensor arrangement and mention the application of each arrangement. (3 mark)
c. Briefly explain the types of pixel neighborhood by providing suitable examples. (4.5 mark)
d. Explain what is sampling and quantization while describing the picture below. (5.5 mark)



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3.

a. What is meant by the process **filtering** and why filters are used in Digital Image Processing? (2.5 mark)

b. Differentiate max and min filters of spatial filtering. (2 mark)

c. List degradations that affect the digital images. (2.5 mark)

d. What are the advantages of constructing histogram for gray level images? (2.5 mark)

e. Construct the histogram for the following image segment. (6 mark)

10	10	11	14	12
12	11	10	10	10
15	11	10	10	10
11	16	12	12	10
10	12	14	11	12

4.

a. What are the arithmetic operations that can be performed in images? (2.5 mark)

b. Briefly describe the operations **rounding** and **clipping** performed in arithmetic operations by providing suitable examples. (3 mark)

c.

i. Define **edge** of an image. (1 mark)

ii. What are the importance of Edge Detection? (2 mark)

d. List the various discontinuities that cause edges in an image. (2 mark)

e. Compute the G_x gradients for the given image segment using the Sobel kernel provided below. (7 mark)

$$\textbf{Sobel kernel} = \begin{matrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{matrix}$$

10	50	50	10
10	55	55	10
10	60	60	10
10	55	55	10

5.

a.

i. Define **Image Segmentation** and list four (04) applications of it. (3.5 mark)

ii. Briefly explain why Image Segmentation is important in Image Processing. (2.5 mark)

b.

i. Differentiate the morphological operations **erosion** and **dilation.** (3 mark)

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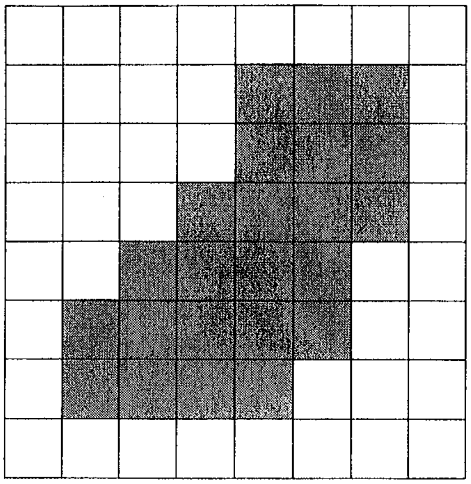
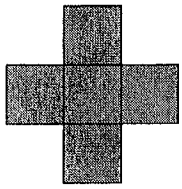
ii. Perform both **erosion** and **dilation** for the image below using the given structuring element and draw the resultant images separately in the grids given below in the question paper. (14 mark)

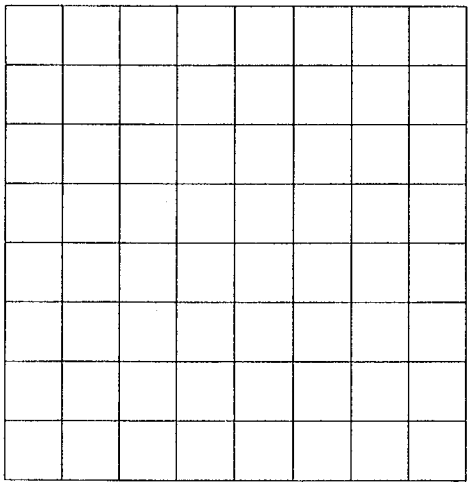
Original Image



Structuring Element



Resultant Image from Erosion



Resultant Image from Dilation