Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2019/2020

COURSE NAME	:	IMAGE PROCESSING
COURSE CODE	:	BEC 42203
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JULY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWERS **ALL** QUESTIONS. **ONLINE EXAMINATION**

THIS QUESTION PAPER CONSISTS OF THREE **(3)** PAGES

Q1 Referring to **Figure Q1**, propose a new set of pixel values for original image, $f(x,y)$. Compute the output of the 3 × 3 Sobel edge detector as shown in **Figure Q1** at pixel location (2,2).

x \ y	1	2	3
1	?	?	?
2	?	?	?
3	?	?	?

(i) Original image, $f(x,y)$

-2	-1	0
-1	0	1
0	1	2

(ii) Sobel edge detector

Figure Q1

(15 marks)

Q2 Referring to **Figure Q2**, propose a new set of pixel values for original image, $f(x,y)$. Compute the output of a 3 × 3 maximum filter at (2,3) using zero padding technique.

x \ y	1	2	3
1	?	?	?
2	?	?	?
3	?	?	?

Original image, $f(x,y)$

Figure Q2

(11 marks)

Q3 Referring to **Figure Q3**, propose a new set of pixel values for original image, $f(x,y)$.

x \ y	1	2	3	4	5
1	?	?	?	?	?
2	?	?	?	?	?
3	?	?	?	?	?
4	?	?	?	?	?
5	?	?	?	?	?

Original image, $f(x,y)$

Figure Q3

(a) Compute the output of a 3 × 3 average filter at (3,3).

(13 marks)

(b) Compute the output of a 5 × 5 average filter at (3,3).

(10 marks)

Q4 A simple 1D wavelet transform works by performing just two operations: taking averages of two values and differencing. Propose a new set of pixel value for the vector, V.

$$V = [?, ?, ? ?, ?, ?, ?, ?, ?]$$

Create a new vector $d1$, which is the discrete wavelet transform at decomposition level 1 of the original vector V. *Show all your calculation. (round the values to the nearest integer)*

(16 marks)

Q5 Referring to **Figure Q5**, propose a new set of pixel values for original image, $f(x,y)$.

x \ y	1	2	3
1	?	?	?
2	?	?	?
3	?	?	?

Original image, $f(x,y)$

A

x \ y	1	2	3
1	1	2	3
2	4	5	6
3	7	8	9

B

Figure Q5

(a) Find the output pixel value for the erosion of ***A*** and ***B*** for pixel location at location at (1,1) with using padding technique.

(19 marks)

(b) Find the output pixel value for the erosion of ***A*** and ***B*** for pixel location at (1,1) without using padding technique.

(10 marks)

(c) Based on result in **Q5(a) and Q5(b)**, which of technique provide darker image result? Provide brief justification for your answer.

(6 marks)

-END OF QUESTIONS –