



**UTHM**  
Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
(ONLINE)  
SEMESTER II  
SESSION 2019/2020**

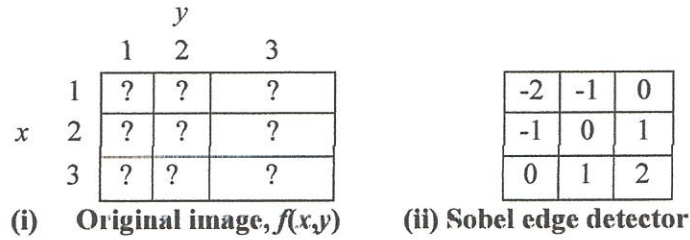
COURSE NAME : IMAGE PROCESSING  
COURSE CODE : BEC 42203  
PROGRAMME CODE : BEJ  
EXAMINATION DATE : JULY 2020  
DURATION : 3 HOURS  
INSTRUCTION : ANSWERS ALL QUESTIONS.  
ONLINE EXAMINATION

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

CONFIDENTIAL

**TERBUKA**

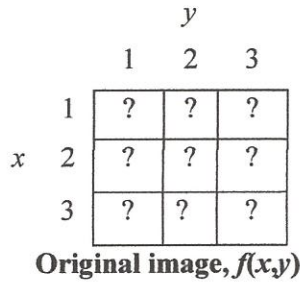
**Q1** Referring to **Figure Q1**, propose a new set of pixel values for original image,  $f(x,y)$ . Compute the output of the  $3 \times 3$  Sobel edge detector as shown in **Figure Q1** at pixel location (2,2).



**Figure Q1**

(15 marks)

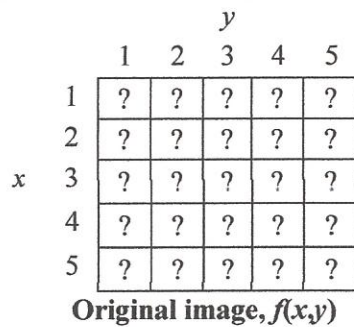
**Q2** Referring to **Figure Q2**, propose a new set of pixel values for original image,  $f(x,y)$ . Compute the output of a  $3 \times 3$  maximum filter at (2,3) using zero padding technique.



**Figure Q2**

(11 marks)

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



**Figure Q3**

(a) Compute the output of a  $3 \times 3$  average filter at (3,3).

(13 marks)

(b) Compute the output of a  $5 \times 5$  average filter at (3,3).

(10 marks)



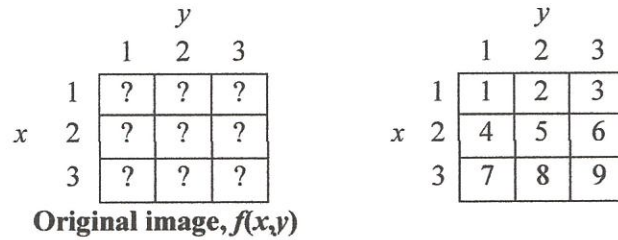
**Q4** A simple 1D wavelet transform works by performing just two operations: taking averages of two values and differencing. Propose a new set of pixel value for the vector,  $V$ .

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

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,  $f(x,y)$ .



**A**

**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 -

