Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023

COURSE NAME	:	IMAGE PROCESSING
COURSE CODE	:	BEJ 42903/ BEC 42203
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	FEBRUARY 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER ALL QUESTIONS 2.THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK.** 3.STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF EIGHT **(8)** PAGES

PART 1: Objective Questions

Q1 Which of the following type of noise is suggested to be removed by using frequency domain filter?

(a) Salt and Pepper noise
(b) Gaussian noise
(c) Periodic noise
(d) All above

(2 marks)

Q2 Based on **Equation Q2**, given R and a structuring element Q. The equation is used to calculate

$$R^{\circ}Q=(R\ominus Q)\oplus Q$$

Equation Q2

(a) opening
(b) closing
(c) dilation
(d) erosion

(2 marks)

Q3 Closing technique is performed by applying

(a) erosion followed by a dilation
(b) dilation followed by an erosion
(c) erosion followed by a closing
(d) dilation followed by a closing

(2 marks)

Q4 Which compression scheme is the most suitable for compressing image in **Figure Q4**?

Figure Q4

(a) Lossless compression
(b) Lossyless compression
(c) Losy compression
(d) Lossy compression

(2 marks)

Q5 Figure **Q5** shows a model of the image degradation process. $g(x,y)$ represents

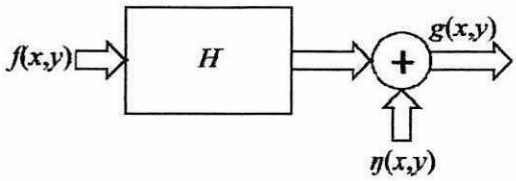


Figure Q5

(a) degradation function
(b) additive noise
(c) degraded image
(d) input image

(2 marks)

Q6 Which is the principle source of noise causing image degradation?

(a) sensor temperature
(b) light condition
(c) atmospheric disturbance
(d) all above

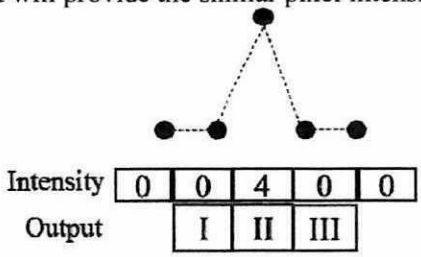
(2 marks)

Q7 Which of these statements describing a dot?

(a) an edge segment where the intensity of the background on either side of the line is either much higher/lower than the intensity of the line pixels light condition
(b) viewed as a line whose length and width are equal to one pixel
(c) sets of connected edge pixels
(d) local image processing methods designed to detect edge pixels

(2 marks)

Q8 **Figure Q8** shows the derivative condition between first-order and second order derivatives. Evaluate which output will provide the similar pixel intensity value for this isolate point?



$$f'(x) = f(x+1) - f(x)$$
$$f''(x) = f(x+1) + f(x-1) - 2f(x)$$

Figure Q8

(a) I
(b) II
(c) III
(d) I and II

(2 marks)

Q9 Based on Equation **Q9**, the following threshold technique is referred to as

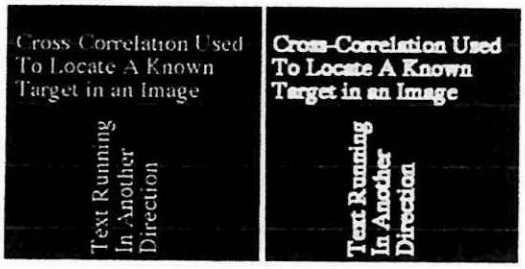
$$g(x,y) = \begin{cases} 1 & if\ f(x,y) > 215 \\ 0 & if\ f(x,y) \leq 215 \end{cases}$$

Equation Q9

(a) multiple threshold
(b) global threshold
(c) double threshold
(d) adapt threshold

(2 marks)

Q10 **Figure Q10(b)** is the result of performing dilation to **Figure Q10(a)**. If we repeatedly perform dilation the resulting image, what will happened to the output image?



(a) **(b)**

Figure Q10

(a) we would end up with a thinner words
(b) we would end up with a thicker words
(c) we would end up with a completely black image
(d) we would end up with a completely white image

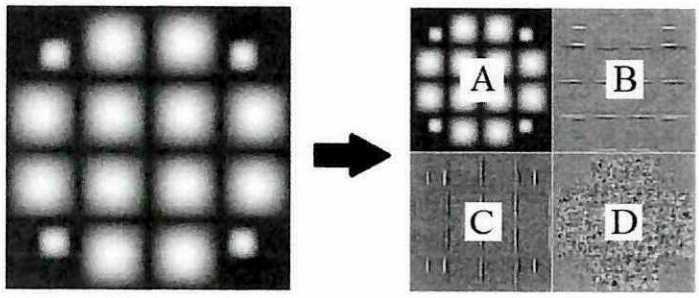
(2 marks)

Q11 IDWT stands for

(a) Inverse Depth Wavelet Transform
(b) Inverse Discrete Wave Transform
(c) Inverse Discrete Wavelet Transform
(d) Invert Discrete Wavelet Transform

(2 marks)

Q12 **Figure Q12** shows the result of decomposition level =1 of the wavelet transform. Subimage A shows the result of _____filter?



(a) **(b)**

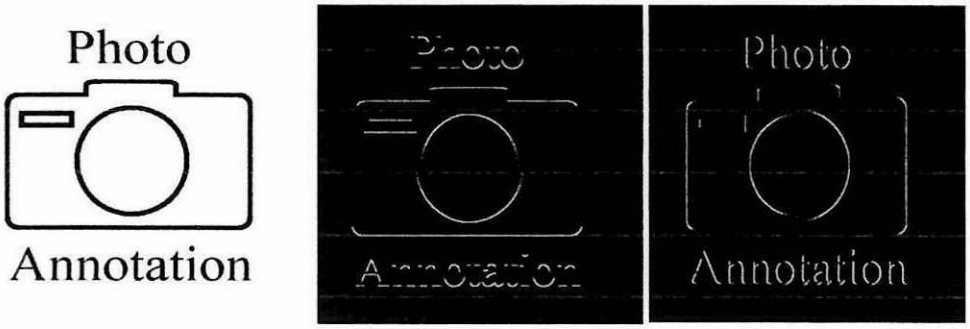
Figure Q12

(a) HH
(b) HL
(c) LH
(d) LL

(2 marks)

PART 2: Subjective Questions

Q13 **Figure Q13(b)** and **Figure Q13(c)** show the results of applying edge detector in two preferred directions. Propose 3x3 masks to detect edges in the preferred direction for each image, respectively. Use coefficients values **-1** and **2** for the masks.



(a) **(b)** **(c)**

Figure Q13

(9 marks)

Q14 Based on **Figure Q14**, which pixel values on locations (x,y) represent the grayscale intensity values. Compute the output of the 3 × 3 Sobel edge detector as shown in **Figure Q14 (b)** at pixel location (2,2).

		y 1	2	3
	1	100	120	15
x	2	50	40	22
	3	10	44	255

(a) Original image, *f*(*x*,*y*)

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

(b) Sobel edge detector

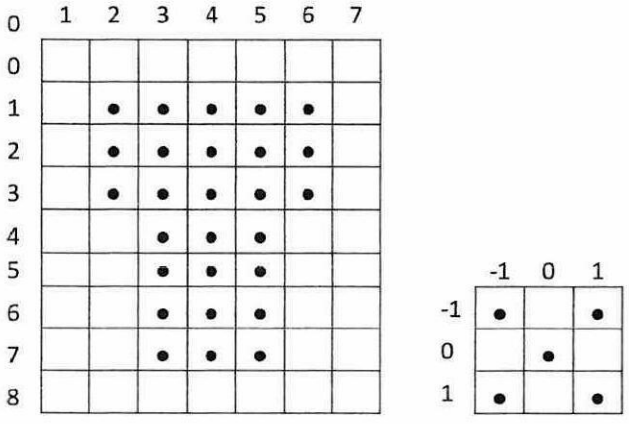
Figure Q14

(10 marks)

Q15 Based on **Figure Q15**,

(a) perform morphological gradient to **Figure Q15(a)**. (9 marks)

(b) explain the effect of morphological gradient to the image. (4 marks)



(a) Original image, A **(b) Kernel, B**

Figure Q15

Q16 Based on **Figure Q16**, which pixel values on locations (x,y) represent the grayscale intensity values, compute the output of a 3×3 median at for the shaded pixels using zero padding technique, then show the final output of the filtering result.

		y 1	2	3
	1	40	25	255
x	2	170	5	50
	3	100	15	20

Figure Q16

(15 marks)

Q17 Based on **Figure Q17**, which pixel values on locations (x,y) represent the grayscale intensity values for sets of pixels ***A*** and Image ***B***,

(a) find the output pixel value for the dilation of ***A*** and ***B*** for shaded pixels using zero padding technique, then show the final output of the filtering result. Show your step-by-step- process.

(23 marks)

(b) discuss the type of effect and cause of effect for dilation to the shaded pixel areas.

(2 marks)

		y		
		1	2	3
x	1	30	30	40
	2	30	30	50
	3	40	50	50

A

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

B

Figure Q17

-END OF QUESTIONS –