Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016

COURSE NAME	:	IMAGE PROCESSING
COURSE CODE	:	BEC42203
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JUNE/JULY 2016
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL**QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

PART A

Q1 The first step in image restoration is finding an appropriate image degradation model. The most common choice is: $y(i,j) = x(i,j)*d(i,j) + n(i,j)$.

(a) Briefly explain what do $y(i,j) = x(i,j)*d(i,j) + n(i,j)$represent in the above equation?

(i) $y(i,j)$
(ii) $x(i,j)$
(iii) $d(i,j)$
(iv) $n(i,j)$

(4 marks)

(b) Predict the image degradation situation where the camera's sensor temperature increases when the image is taken. Specifically, how $n(i,j)$ will be effected?

(2 marks)

(c) Briefly explain TWO (2) characteristics differences betweenSalt-and-Pepper Noise and Gaussian Noise in terms of cause and appearance.

(8 marks)

Q2 The most common techniques for edge detection make use of the first and second derivatives of an image to locate discontinuities in image intensity.

(a) A binary image contains straight lines oriented horizontally and - 45 degree. Assume that the intensities of the lines and background are 1 and 0, respectively. ProposeTWO (2) 3x3 masks that can be used to detect 1-pixel breaks for horizontal and - 45 degree lines, respectively. Use coefficients valued -2 and 4 for the mask.

(10 marks)

(b) Edge models are classified according to their intensity profiles.Categorize the edge models in **Figure Q2(b)**.

(4 marks)

(c) Propose TWO (2) 3x3 masks of Prewitt methodfor finding horizontal edges and vertical edges, respectively.

(10 marks)

(d) Explain briefly thecondition of threshold value, T, for global thresholding and adaptive (local/variable) thresholding schemes.

(4 marks)

PART B

Q3 The matrices in **Figure Q3** represent an image A and structuring elements B. Assume that the intensities of the object and background are 1 and 0, respectively.

(a) Provide the equation for dilation,erosion, opening and closing for A and B, respectively.

(8 marks)

(b) Produce theoutput matrix D for the dilation for A and B.

(6 marks)

(c) Produce the output matrix D for the erosion for A and B.

(6 marks)

(d) Based on the results in Q3(b) and Q3(c), conclude the effect of dilation and erosion to image A.

(4 marks)

Q4 A simple 1D inverse wavelet transform works by performing just two operations: addition and substraction. Analyze the given vector, $d1$, which is the discrete wavelet transform at decomposition level 1 of the original vector V.

$$d1 = [138\ ,\ 50,\ 68,\ \ 32,\ 4\ ,\ -2,\ 4,\ \ -4]$$

(a) Recover the original vector V by performing inverse wavelet transform. Show your works.

(24 marks)

(b) Image compression is useful to reduce the amount of data required to represent an image. Draw a diagram showing forward wavelet transform with decomposotion level 2 for low pass filter output image for decomposition level 2, $fLL(x,y)$, and high pass filter output image for decomposition level 2, $fLH(x,y)$. Given the original image is represented as $f(x,y)$, lowpass filter as H_bar, highpass filter as G_bar, $fL(x,y)$ as low pass filter output image for decomposition level 1 and $fH(x,y)$ as high pass filter output image for decomposition level 1, respectively.

(10 marks)

- END OFQUESTIONS–

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2015/2016
COURSE NAME : IMAGE PROCESSING

PROGRAMME CODE : BEJ
COURSE CODE:BEC42203

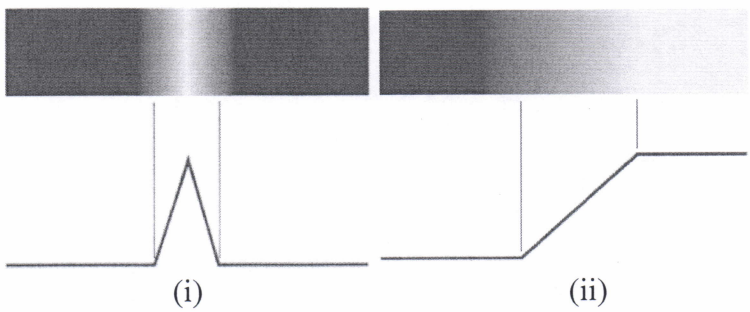

Figure Q2(b)

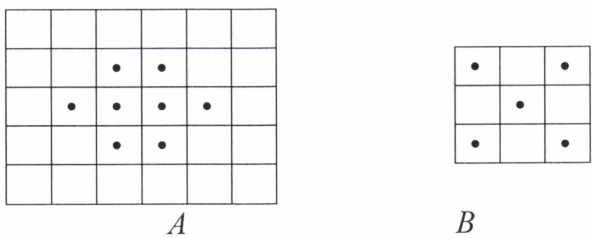

Figure Q3