Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science and Technology
300 Level 2nd Semester Examination – Jan. / Feb. 2016
CST 362-3 Digital Image Processing

Uva Wellassa University

Instructions to candidates
Duration: Three (03) hours
Number of questions: Seven (07) essay questions
Answer **six (06)** questions **including question 01.**
Mark allocation: 160

1.

a. Describe the key stages of digital image processing.

(4 mark)

b. Briefly describe the term **Intensity** of an Image.

(4 mark)

c. What is meant by **Sampling** in image acquisition ?

(4 mark)

d. Describe any three (03) colour models.

(5 mark)

e. List any four (04) applications of image processing and describe any two (02) of them.

(5 mark)

f. List any three (03) digital image sensors.

(3 mark)

g. An image can be represented as product of **reflection** and **light source**. Briefly explain the statement with aid of diagrams and equations.

(5 mark)

h. Determine the number of kilobytes(kB) required in order to store an uncompressed gray scale image of size **1024 x 1024** pixels using eight (08) **bits** depth.

(5 mark)

2.

a. State the significant differences between **RGB** and **gray scale** image.

(3 mark)

b. Briefly explain what is **thresholding** in image processing.

(3 mark)

c. Explain how to convert a **gray scale** image into **black and white** image.

(5 mark)

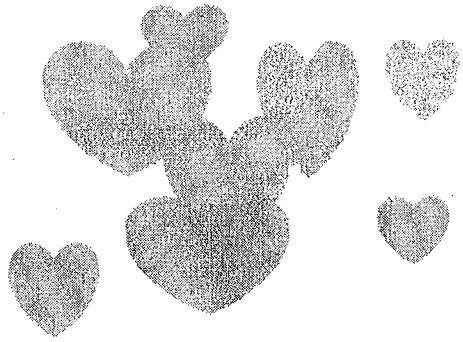
d. Use the above given method (2c) to derive the black and white image matrix for gray scale image matrix given below using **any** threshold value.

240	112	210	100
75	16	15	15
72	251	251	251
71	241	247	85

(7 mark)

07

e. Develop an image processing method to count the objects (heart shape) in the image given below and list all the steps.



(7mark)

3.

a. Briefly describe any two (02) **image enhancement** techniques.

(4 mark)

b. Describe the basic steps for **image enhancement** technique in detail in frequency domain.

(4 mark)

c. Explain what is **filtering** in image enhancement with a suitable example.

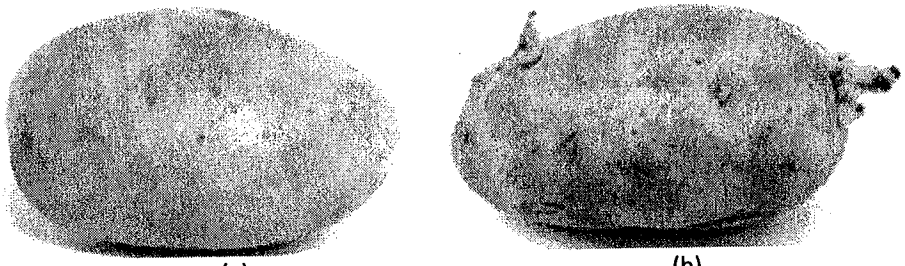
(4 mark)

d. Describe how **median filter** works and perform **median filtering** to the image region given below.

18	24	15	06
16	16	19	15
15	45	45	65
200	180	210	18

(6 mark)

e. Analyze how image processing technique can be used to find the **sprouted potatoes** in the sorting line of a potato chips manufacturing company using the images given below.



(a) (b)

(a) normal sample (b) sample with tuber sprouts

(7 mark)

4.

a.

i. What is meant by **histogram** in image processing? (5 mark)

ii. Construct a histogram for the image region given below.

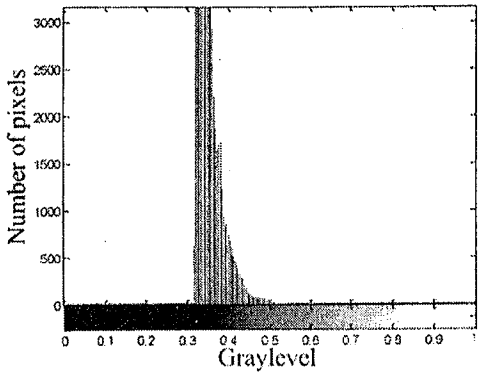
0	1	2	2	1	3
0	0	1	2	2	2
1	0	1	0	2	3
2	1	1	2	3	3
2	1	0	2	4	4
1	2	2	4	4	4

(7 mark)

b. Propose an image processing method to use the palm print to recognize the person using the image given below and list all the steps.

(7 mark)

c. Draw the equalized histogram for the histogram given below.



(6 mark)

5.

a. Briefly describe what is an edge in an image. (3 mark)

b. Explain how an **edge** can be detected in an image. (5 mark)

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c. Draw the Brightness against Spatial Coordinates graphs for the portion of images given below (**A&B**).

(9 mark)

d. List any three (03) edge detection filters.

(3 mark)

e. Describe the importance gradient $\nabla f = \left[\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}\right]$ in edge detection.

(5 mark)

6.

a.

i. Describe what is meant by **image segmentation**.

(5 mark)

ii. List any two (02) segmentation techniques.

(3 mark)

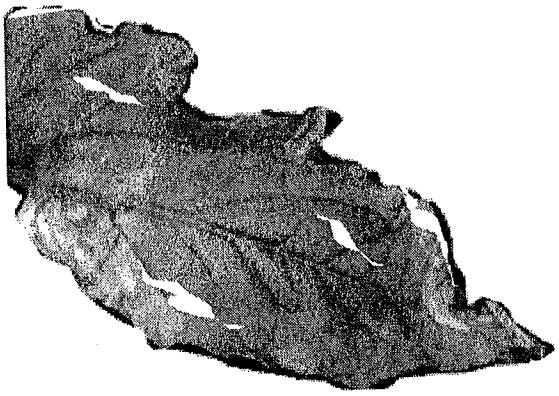
b. Briefly describe how **clustering** works with an example.

(4 mark)

c. Describe the use of segmentation in medical image processing.

(5 mark)

d. Explain an appropriate method to extract the affected region (disease) of the image of the leaf given below.



(8 mark)

7.

a. Briefly describe the connectivity paths given below with suitable diagrams.

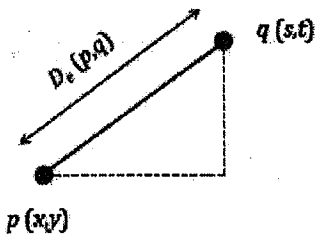
i. 4 way

ii. 8 way

iii. M way

(8 mark)

b. Find the equation for **Euclidean Distance** between p and q using the figure given below.

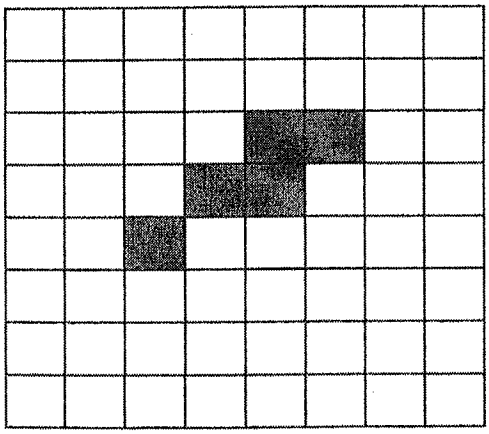


(3 mark)

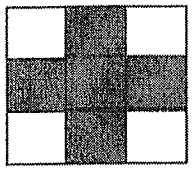
c. Explain the terms **HIT** and **FIT** in morphological operation based on **Structuring Elements**.

(4 mark)

d. Draw the output for morphological operation **A** ⊕ **B**.



A



B

(10 mark)

07