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Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Computer Science and Technology Degree Programme
3rd year 2nd Semester Examination August/September 2014
CST362-3 Digital Image Processing

This paper consists of **Two (02) parts.** Part-A, Part-B
Answer all Questions.
Mark allocation: Part-A: 50, Part-B: 50
Total time allocation: Three (03) hrs. **Part-A: One (01) hour. Part-B: Two (02) hours.**
Number of questions: Two (02)

Part (A)

1.

a. What is a digital Image? (2 mark)

b. Describe the key stages of digital image processing. (5 mark)

c. Describe the phenomenon of brightness adaption in the human eye. (2 mark)

d. Describe three (03) types of pixel relationships with suitable diagrams. (6 mark)

e. List four (04) geometric transformation methods. (2 mark)

f. Describe following distance measurers using appropriate diagrams

i. Euclidean (2 mark)

ii. Cityblock (2 mark)

iii. Chessboard (2 mark)

g. Rotate following image segment by,

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \\ 10 & 11 & 12 \end{bmatrix}$$

i. 90° counterclockwise. (1 mark)

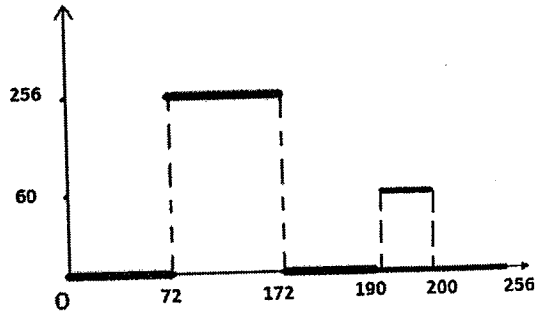
ii. 180° counterclockwise rotation. (1 mark)

2.

a. A subset of a digital image is shown below.

130	108	119	218	16	197	62	235
61	182	45	60	203	60	34	196
117	150	149	94	124	33	225	249
246	166	246	89	187	211	40	168
155	105	137	133	78	235	6	245
227	172	198	172	32	82	115	100
96	12	237	48	152	14	123	42
239	214	118	171	204	92	50	132

Perform the gray level transformation according to the following graph below and write the resultant of image segment. (6 mark)



b. Differentiate time-varying signals from spatially-varying signals. (2 mark)

c. What is meant by Histogram Equalization? (2 mark)

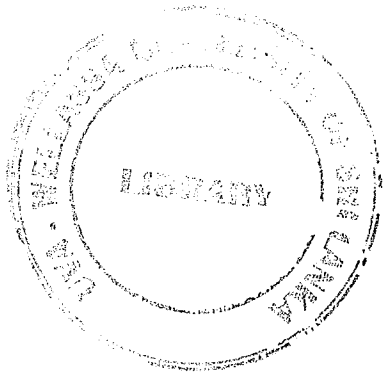
d. Differentiate linear spatial filtering from non-linear spatial filtering.

e. Common measure of transmission for a digital data is the Baud rate, defined as the number of bits transmitted per second. Generally, transmission is accomplished in packets consisting of a start bit, a byte (8 bits) of information, and a stop bit. Using these facts answer the following:

i. How many minutes it would take to transmit a 1024 X 1024 image with 256 gray levels, using a 56K baud modem. (4 mark)

ii. What would the time be at 750K baud, a representative speed of a phone DSL (Digital Subscriber Line) connection? (4 mark)

f. High-definition television (HDTV) generates images with a resolution of 1125 horizontal TV lines interlaced (where every other line is painted on the tube face in each of two fields, each field being 160th of a second in duration). The width to-height aspect ratio of the images is 16:9. The fact that the horizontal lines are distinct fixes the vertical resolution of the images. A company has designed an image capture system that generates digital images from HDTV images. The resolution of each TV (horizontal) line in their system is in proportion to vertical resolution, with the proportion being the width-to-height ratio of the images. Each pixel in the color image has 24 bits of intensity resolution, 8 pixels each for a red, a green, and a blue image. These three "primary" images form a color image. How many bits would it take to store a 2-hour HDTV program/movie? (7 mark)



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