Digital Image Processing
Course Code: CSE395
Spring Semester Exam.

BME Program - Level 300
Exam Date: 30-3- 2019
Allowed Time: 1 Hour

Attempt all questions. Assume any missed data. Full mark is 20

Q.1) Give a *detailed answer* to each of the following questions: **[12 Marks]**

i. If you have a 512x512 grey-scale image, determine its size. How can you transform it into a binary image? Will the size change? If yes, determine the size of the binary image.

ii. *"We can perform lightening or darkening of an image by addition, subtraction, multiplication, and division".* Sketch the characteristics of a grey-scale image if we, add 100. Compare your results with the characteristics obtained if we divide by 2.

iii. *"The result of applying a linear filter may be values outside the range (0-255)".* Suggest two different methods to overcome this problem.

iv. *"The Fourier transform is of fundamental importance to image processing".* Justify this statement. Write the two equations that define forward and inverse 2D-DFT .

Q.2.a) Given a 5x5 image segment '*X*'

$$X = \begin{bmatrix} 170 & 240 & 010 & 080 & 150 \\ 230 & 050 & 070 & 140 & 160 \\ 040 & 060 & 130 & 200 & 220 \\ 100 & 120 & 190 & 210 & 030 \\ 110 & 180 & 250 & 020 & 090 \end{bmatrix}$$

Apply an average filter to the image? Adjust output values. Select a threshold to transform the output image into a binary one. **[6 Marks]**

Q.2.b) Suppose a 4-bit grey-scale image has the following grey values distribution:

i	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
n_i	20	100	200	90	160	80	40	20	0	0	0	0	0	0	0	100

i. Sketch the histogram of this image. What do you expect about the image appearance?

ii. Use histogram equalization to improve the image. Sketch the result. **[6 Marks]**

☺ ***Best wishes*** ☺

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