Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 713103N **Date: 03-01-2014**

Subject Name: Biomedical Image Processing

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** What do you mean by global and local Histogram Processing? Give a difference of both with necessary example. **07**

(b) Briefly explain spatial filtering. Derive the mathematical formulation of spatial correlation and convolution. **07**

Q.2 **(a)** Give a comparison between histogram equalization and histogram matching with appropriate example. **07**

(b) Describe the terminologies given below in brief. **07**

a) Image Sampling
b) Image Quantization

OR

(b) Give a brief illustration of structure and function of human eye with neat sketch. **07**

Q.3 **(a)** Enlist and explain any one relationship between pixels in digital image. **07**

(b) Consider the two image subsets, S_1 and S_2, shown in the following figure. For V={1}, determine whether these two subsets are (a) 4-adjacent, (b) 8-adjacent, or (c) m-adjacent. **07**

	S_1				S_2				
0	0	0	0	0	0	0	1	1	0
1	0	0	1	0	0	1	0	0	1
1	0	0	1	0	1	1	0	0	0
0	0	1	1	1	0	0	0	0	0
0	0	1	1	1	0	0	1	1	1

OR

Q.3 **(a)** Briefly describe the brightness Adaptation and Discrimination. **07**

(b) Enlist different types of noise. Explain any two in brief with mathematical description. **07**

Q.4 **(a)** Enlist the fundamental steps in digital image processing and explain any two in brief. **07**

(b) Write a short note on non liner contrast stretching. **07**

OR

Q.4 **(a)** What do you mean by unsharp masking? Explain it by 1-D illustration of a signal. **07**

Q.4 **(b)** Write a short note on liner contrast stretching.. **07**

Q.5 **(a)** Briefly explain Short Time Fourier Transform (STFT) in context for image with its any three properties. **07**

(b) Suppose that a 3-bit image of size 128*128 pixels has the intensity distribution as shown below. Draw and calculate below mentioned entities. **07**

a) Normalized Histogram of original image

b) Transformation Function
c) Equalized Histogram

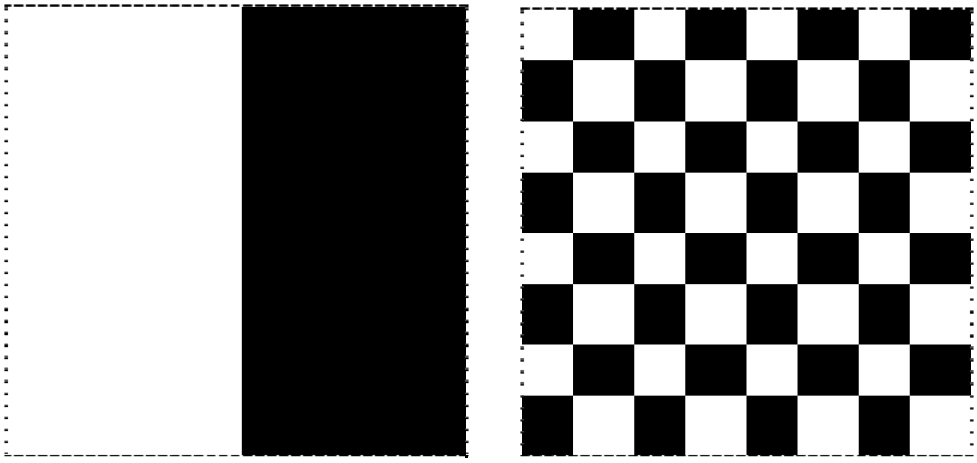
r_k	n_k
$r_0 = 0$	324
$r_1 = 1$	488
$r_2 = 2$	980
$r_3 = 3$	1316
$r_4 = 4$	2624
$r_5 = 5$	3400
$r_6 = 6$	4092
$r_7 = 7$	3160

OR

Q.5 **(a)** What do you mean by sharpening spatial filters? Explain Laplacian filter for sharpening of image. **07**

(b) Draw the histograms of the images given below, if both its' sizes are 8*8 pixels and they are 8-bit images. Suppose that each image is blurred with a 3*3 averaging mask. **07**

a) Would the histogram of the blurred images still be equal? Explain.
b) If your answer is no, sketch the two histograms with appropriate calculations.



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