Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject code: 710404N **Date: 21-06-2014**

Subject Name: Image Processing

Time: 02:30 pm - 05:00 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)** Discuss image sampling and quantization. **07**

(b) Explain different smoothing frequency domain filters. Also discuss about ringing effect. **07**

Q.2 **(a)** Define histogram and normalize histogram of a digital image. Apply histogram equalization on the following 4 x 4, 3-bit digital image. Clearly indicate equalized histogram and the processed image. **07**

2	3	1	2
4	2	3	4
3	2	4	5
2	4	2	5

(b) Differentiate between linear and non-linear filters. What is contrast stretching? Describe how it can be achieved using non-linear and piecewise-linear transformation. **07**

OR

(b) How salt-and-pepper noise can be removed? Justify with the help of suitable examples. Also discuss steps for filtering digital image in the frequency domain. **07**

Q.3 **(a)** Discuss Wiener filter in details. **07**

(b) Explain Haar transform. **07**

OR

Q.3 **(a)** Describe the model of image degradation/restoration process. Also describe Inverse filtering in details. **07**

(b) What is the role of Laplacian in digital image segmentation? Why is it not used generally in its original form for edge detection? Discuss Laplacian of a Gaussian (LoG). **07**

Q.4 **(a)** Discuss morphological opening and closing of binary images. Also discuss applications of opening and closing. **07**

(b) Describe various steps performed in JPEG 2000. **07**

OR

Q.4 **(a)** Explain morphological erosion and dilation of gray-scale images using flat and non-flat structuring element. Also discuss use of morphological operations for textural segmentation. **07**

Q.4 **(b)** Discuss H.26x in details. **07**

Q.5 **(a)** Explain Hough transform in details. **07**

(b) Discuss various statistical approaches for describing texture. **07**

OR

Q.5 **(a)** Describe the use of basic global and basic adaptive thresholding for digital image segmentation. **07**

(b) Explain how principal components can be used to describe images. **07**