Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2013**

**Subject code: 1710404** **Date: 03-06-2013**

**Subject Name: 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)** Explain Image Sensing and Acquisition. How illumination energy is transformed into the digital image with different sensors ? **07**

**(b)** Define Histogram. Explain Statistics obtained from the Image Histogram. How it is used for image enhancement? Derive histogram statistics for the following 2 bit image. **07**

$$A = \begin{matrix} 0 & 0 & 1 & 1 & 2 \\ 1 & 2 & 0 & 1 & 2 \\ 2 & 1 & 2 & 3 & 3 \\ 3 & 0 & 3 & 0 & 1 \\ 1 & 2 & 0 & 2 & 3 \end{matrix}$$

**Q.2** **(a)** What is Image Smoothing ? Explain Spatial domain smoothing Filters. Apply any one Order Statistic filter with 2 x 2 mask on the image I. **07**

$$I = \begin{matrix} 10 & 20 & 10 & 10 & 20 \\ 15 & 20 & 20 & 15 & 25 \\ 25 & 15 & 25 & 30 & 30 \\ 35 & 10 & 30 & 10 & 15 \\ 10 & 20 & 05 & 25 & 30 \end{matrix}$$

**(b)** Define Spatial Resolution and Intensity resolution? How this two parameters interact in determining perceived image quality ? **07**

**OR**

**(b)** Which characteristics used to distinguish one color from another? Which approaches are used for specifying colors? Explain the RGB and HSI color models and relationship between them. **07**

**Q.3** **(a)** Explain High boost filter and Unsharp filter. **07**

**(b)** Discuss the model of image restoration process. Explain different types of noise probability density functions. **07**

**OR**

**Q.3** **(a)** Describe different Edge detection techniques using gradient operator and Laplacian operator. **07**

**(b)** Explain inverse filtering restoration method. State the advantages of wiener filter over inverse filter. **07**

**Q.4** **(a)** Describe Laplacian of Gaussian and Difference of Gaussian. **07**

**(b)** Explain KL (Karhunen-Loeve) transformation. What is Principal Component Analysis ? How it is used in image processing? **07**

**OR**

**Q.4** **(a)** Write a note on JPEG 2002 with encoder and decoder process. What is the advantages of DWT over DCT ? **07**

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| | **(b)** | Explain any two property of 2-D Discrete Fourier Transform. What are the computational advantages of FFT over DFT ? Write the steps performed for filtering in the Frequency domain. | **07** |
| **Q.5** | **(a)** | Write a note on Image pyramid and Subband coding. Describe discrete Wavelet Transform. | **07** |
| | **(b)** | Give a brief summary on Morphological operations. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Explain Hit and Miss transformation used for corner detection. | **07** |
| | **(b)** | Describe different boundary descriptors. | **07** |

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