Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. IIND Semester Examination – June/July- 2011

Subject code: 1710404

Subject Name: Image Processing

Date:29/06/2011 **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)** Answer the following questions:

i) Distinguish between spatial domain techniques and frequency domain techniques of Image enhancement. **02**

ii) What is gamma correction? What is its importance? **02**

iii) What is mean and standard deviation of the histogram? What are the physical significances of these quantities? **02**

iv) There are two images I_1 and I_2. They have identical histograms. Suppose we form a third image I_3 as $I_3=I_1 - I_2$. Will this image I_3 be a zero image? Give reason for your answer. **01**

(b) Explain the method of histogram equalization considering the histogram to be continuous. What is the difference in the result if the histogram is discrete? **07**

Q.2 **(a)** Describe image sampling and quantization process in detail. A common measure of transmission for 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, calculate: How many minutes would it take to transmit a 1024 X 1024 image with 256 gray levels using a 56K baud modem? **07**

(b) Explain: (i) Spatial and Gray-level resolution (ii) False contouring. **07**

Suppose that a flat area with centre at (x_0,y_0) is illuminated by a light source with intensity distribution $i(x,y)=Ke^{-[(x-x_0)^2+(y-y_0)^2]}$. Assume for simplicity that the reflectance of the area is constant and equal to 1.0, and let K=255. If the resulting image is digitized with k bits of intensity resolution, and the eye can detect an abrupt change of eight shades of intensity between adjacent pixels, what value of k will cause visible false contouring?

OR

(b) Explain the concept of Adjacency, Connectivity, Regions and Boundaries. Consider the image segment shown below. **07**

$$\begin{array}{cccccc} & 3 & 1 & 2 & 1 & (q) \\ & 2 & 2 & 0 & 2 & \\ & 1 & 2 & 1 & 1 & \\ (p) & 1 & 0 & 1 & 2 & \end{array}$$

Let V= {0, 1} and compute the lengths of the shortest 4-, 8-, and m-path between p and q. If a particular path does not exist between these two points, explain why.

Q.3 **(a)** Discuss Image smoothing with the following: **07**

i) Low pass spatial filtering.

ii) Median filtering.

Compare both filtering methods. What are the effects of changing the filter size?

(b) Answer the following questions: **07**

i) Discuss Homomorphic filtering approach for image enhancement.

ii) Explain why zero padding is required when DFT of an image is taken to filter the image.

OR

Q.3 **(a)** Answer the following questions: **07**

i) What is meant by local enhancement? Discuss its importance.

ii) Show that subtracting the Laplacian from an image is proportional to unsharp masking. Also explain the Laplacian in frequency domain.

(b) Answer the following questions: **07**

i) What is a transform coding? Write brief note on KL transform.

ii) How different transforms used in transform coding differ? Discuss the salient features of Discrete Cosine transform.

Q.4 **(a)** Draw a model of the image degradation/restoration process and discuss Linear, Position-Invariant degradations in brief. Also define the Point Spread Function (PSF) of a Linear Shift Invariant (LSI) operator. **07**

(b) Discuss & compare Inverse filtering and Wiener filtering for image restoration. **07**

OR

Q.4 **(a)** i) Explain HSI color model in brief and discuss the procedure for conversion from HSI to RGB color model. **05**

ii) Explain the principle of Pseudocolor image processing. **02**

(b) What are the continuous tone still image compression standards? Discuss JPEG 2000 compression standard in detail. **07**

Q.5 **(a)** How the discontinuity is detected in an image using segmentation? Explain various operators used for image segmentation based on edge detection. **07**

(b) Answer the following questions: **07**

i) What do you understand by Opening and Closing operations in morphological image processing? Explain in brief.

ii) Discuss morphological Hit-or-Miss Transform for shape detection.

OR

Q.5 **(a)** Answer the following questions: **07**

i) Explain global processing using the Hough transform.

ii) What is thresholding? Explain basic global thresholding in brief.

(b) Answer the following questions: **07**

i) Write a brief note on Chain codes.

ii) What are the approaches used to describe the texture of a region. Explain any one in brief.

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