Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Regular Examination January / February 2011

Subject code: 712603N

Subject Name: Digital Image Processing and pattern Recognition

Date: 02 /02 /2011 **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)** Explain an image processing system with necessary components. **07**

(b) Define m-adjacency, connected component and city-block distance with an example. **07**

Q.2 **(a)** A 4 X 4, 4 bit/pixel original image A and a linear shift-invariant system H are given as **07**

$$A = \begin{vmatrix} 12 & 10 & 8 & 4 \\ 8 & 14 & 6 & 9 \\ 5 & 9 & 13 & 8 \\ 14 & 5 & 7 & 9 \end{vmatrix} \qquad H = (1/4) * \begin{vmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{vmatrix}$$

The input image A is passed through a linear shift-invariant system H, determine the output image. Assume zero padding of the original image.

(b) Explain un-sharp masking and high-boost filtering in detail. **07**

OR

(b) Explain homo-morphic filtering in detail. **07**

Q.3 **(a)** Explain with merits and demerits of the TIFF and JPEG image file formats. **07**

(b) Show that the Laplacian operator is invariant to rotation? **07**

OR

Q.3 **(a)** Prove spatial shift and convolution property of the 2D-DFT . **07**

(b) Write short note on adaptive median filter. **07**

Q.4 **(a)** List the advantage of DWT over 2D-DFT. Explain sub-band coding and decoding. **07**

(b) Consider a point transformation which maps the input image f[m, n] into an output image g[m, n] through the transformation T. The input and output images are defined as follows: **07**

(i) Input image f[m, n] = r, where $0 \le r \le 1$

(ii) Output image g[m, n] = s =T(r), where $0 \le s \le 1$

(iii) The transformation is given by T(r) = ar + b

Determine the values of a and b in terms of m_r and σ^2_r , the mean and variance of r. Assume $m_s = 0.5$ and $\sigma^2_s = 0.25\ \sigma^2_r$.

OR

Q.4 **(a)** Define and explain compression ratio, coding redundancy, and temporal redundancy. **07**

(b) Obtain the binary Huffman code for the word 'committee'. Also find average length, entropy and efficiency. **07**

Q.5 **(a)** Prove erosion and dilation is dual of each other w.r.t. set complementation and reflection. **07**

(b) Explain region-growing algorithm based on 8-connectivity for the image segmentation. **07**

OR

Q.5	**(a)**	Write short note on chain codes are used to represent a boundary.	**07**
	(b)	Explain with the significance of patterns and pattern classes for the image processing.	**07**

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