Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII (OLD) - EXAMINATION – SUMMER 2017

Subject Code:181102   **Date:04/05/2017**

Subject Name: Fundamentals of Image Processing (Department Elective - II)

Time:10:30 AM to 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)**	Draw the block diagram of components of digital image processing and explain in detail.	**07**
	(b)	With the help of diagram discuss how an image sensing and acquisition process can be performed?	**07**
Q.2	**(a)**	What is point processing technique? Enlist and explain various point processing techniques used for image enhancement.	**07**
	(b)	The intensity distribution of a 3-bit image of size 64×64 (MN = 4096) pixels is given below:	**07**

r_k	r_0	r_1	r_2	r_3	r_4	r_5	r_6	r_7
n_k	790	1023	850	656	329	245	122	81

Where r_k is a Kth intensity level and n_k is the number of pixels that have intensity level r_k. The image has integer intensity levels in the range [0, 7]. Equalize the histogram of the image.

OR

	(b)	Consider the image segment shown below:	**07**

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

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

    (ii) Repeat for V = {1, 2}.

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

    i.   Distinguish between spatial domain and frequency domain techniques for image enhancement.

    ii. What is gamma correction? What is its importance?

    ii. There are two images I1 and I2. They have identical histograms. Suppose we form a third image I3 as I3=I1 - I2. Will this image I3 be a zero image? Give reason for your answer.

	(b)	What is histogram equalization? How does the histogram equalization process enhance the image?	**07**

OR

Q.3	**(a)**	Explain the concept of frequency domain filtering and also write expressions of all three low pass filter (LPF) and high pass filter (HPF).	**07**
	(b)	Draw the block diagram of homomorphic filtering approach for image enhancement and discuss in detail.	**07**
Q.4	**(a)**	Define a model of image degradation/restoration process, also explain the	**07**

different noise probability density functions (PDF).

(b) Explain Wiener (minimum mean square error) filtering in brief and compare it with inverse filtering. **07**

OR

Q.4 **(a)** Describe HSI color model. Explain in detail how to convert RGB to HSI color model. **07**

(b) What is redundancy in image? List different types of redundancy available in the digital image? Explain inter-pixel redundancy. **07**

Q.5 **(a)** Explain arithmetic coding procedure with appropriate example. What type of redundancy is removed by the arithmetic coding? **07**

(b) Find the Huffman code for the following: **07**

Symbol	a1	a2	a3	a4	a5	a6
Probability	0.1	0.4	0.06	0.1	0.04	0.3

OR

Q.5 **(a)** Explain dilation and erosion morphological operations. Prove that dilation and erosion are duals of each other with respect to set complementation and reflection. **07**

(b) Write a short note: Hit and Miss transform. **07**

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