Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Remedial Examination December 2010

Subject code: 720104 **Subject Name: Digital Image Processing**

Date: 21 /12 /2010 **Time: 02.30 pm – 05.00 pm**
Total Marks: 60

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Explain the spatial and gray-scale resolution for digital images.	**03**
	(b)	Explain RGB model for color images.	**03**
	(c)	Explain contrast stretching and gray-level slicing.	**06**
Q.2	**(a)**	Explain histogram equalization and its application.	**06**
	(b)	Explain various contrast manipulations in images by applying power-law transformations.	**06**
		OR	
	(b)	Explain the linear interpolation for digital images and its application in image-rotation.	**06**
Q.3	**(a)**	Define the Laplacian. Give a mask to implement the digital Laplacian in spatial domain. Also give frequency domain representation of the Laplacian.	**06**
	(b)	Define the gradient. Give a few variants of masks to implement the digital gradient in spatial domain and discuss their applications.	**06**
		OR	
Q.3	**(a)**	Explain two-dimensional convolution for spatial filtering giving an example of a 3-by-3 weighted average filter.	**06**
	(b)	Give the procedure steps for filtering an image in frequency domain. Show the correspondence of the filtering in frequency domain to the spatial filtering.	**06**
Q.4	**(a)**	Define the high-boost filtering. Explain the implementation of the high-boost filtering both in spatial and frequency domain.	**06**
	(b)	Explain the implementation of a two dimensional ideal low-pass filter in frequency domain.	**06**
		OR	
Q.4	**(a)**	Explain the relationship between the scaling and wavelet function spaces. Also explain how the scaling function meets the requirements for a multi-resolution analysis of images.	**06**
	(b)	Explain why blurring and ringing occur in the result image of an ideal low-pass filter.	**06**
Q.5	**(a)**	Express the following PDFs (probability density functions) giving their relevance in image restoration: Gaussian, Rayleight, Erlang, salt-and-pepper, exponential and uniform.	**06**
	(b)	Give a simple model of image degradation and explain restoration using inverse filter. Also discuss the limitations of the inverse filter in presence of additive noise.	**06**
		OR	
Q.5	**(a)**	Explain the Wiener filtering for image restoration. Discuss the advantage of Wiener filtering over inverse filtering for restoration in presence of noise.	**06**
	(b)	Explain the opening and closing operations and their inter-relation. Also discuss their applications in image processing.	**06**

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