GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2024

Subject Code:3161604   **Date:22-05-2024**
Subject Name: Image Processing
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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define : Sampling, Quantization, Resolution	**03**
	(b)	Explain the concept of pixel adjacency and how it is used in connectivity analysis. Provide an example of a practical problem where adjacency connectivity is used.	**04**
	(c)	Explain fundamental steps and objective of each step in digital image processing with proper diagram.	**07**
Q.2	**(a)**	Explain the concept of noise models in image restoration. Provide examples of different types of noise that can affect digital images	**03**
	(b)	Explain Adaptive Filters for image restoration in brief.	**04**
	(c)	Provide a comprehensive overview of various noise models that can corrupt digital images, including Gaussian noise, salt-and-pepper noise, and Poisson noise. Discuss their characteristics and sources.	**07**
		OR	
	(c)	Describe image restoration process with block diagram and explain noisemodels.	**07**
Q.3	**(a)**	Explain RGB color model in brief.	**03**
	(b)	Differentiate: lossy image compression vs lossless image compression.	**04**
	(c)	List out highpass filters used in sharpening image in frequency domain. Explain each in brief.	**07**
		OR	
Q.3	**(a)**	Explain the concept of error-free compression in image processing and how it differs from lossy compression.	**03**
	(b)	List out color models. Explain HIS color model in brief.	**04**
	(c)	List out lowpass filters used in smoothing image in frequency domain. Explain each in brief.	**07**
Q.4	**(a)**	Explain the concept of image negatives in image processing. How does it alter the appearance of an image, and when is it useful?	**03**
	(b)	Explain the concept of linear filters in spatial filtering.	**04**
	(c)	Explain the process of histogram equalization for image enhancement. Highlight its benefits and potential limitations.	**07**
		OR	
Q.4	**(a)**	Describe the fundamental idea behind log transformations for gray level image enhancement. Provide an example scenario where log transformations are applicable.	**03**
	(b)	Explain the concept of order-statistics filters in spatial filtering.	**04**
	(c)	Derive the laplacian operator for image sharpening in spatial domain and show its usage.	**07**

Q.5 **(a)** Briefly explain edge linking in image segmentation. How does it contribute to the process of identifying object boundaries? **03**

(b) Discuss the role of image segmentation in object recognition and image understanding. Provide examples of real-world applications where accurate segmentation is crucial. **04**

(c) Describe image pyramid technique. **07**

OR

Q.5 **(a)** Explain multiresolution expansion using wavelet function. **03**

(b) Discuss Haar transform in detail. **04**

(c) Explain adaptive thresholding in brief. List out theiradvantages over fixed thresholding methods. **07**

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