

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2023****Subject Code:3155204****Date:07-12-2023****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) Explain the concept of the electromagnetic spectrum and its relevance to digital image processing.	03
	(b) Explain the concept of pixel adjacency with example and how it is used in connectivity analysis.	04
	(c) List out fundamental steps in digital image processing and explain each step in brief with proper diagram.	07
Q.2	(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	
	(c) Derive the laplacian operator for image sharpening in spatial domain and show its usage.	07
Q.3	(a) Define image restoration in the context of digital image processing and its significance in improving image quality.	03
	(b) Explain Mean Filters 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	
Q.3	(a) List out Spatial and Frequency Properties of Noise.	03
	(b) Explain Adaptive Filters in brief.	04
	(c) Describe image restoration process with block diagram and explain noisemodels.	07
Q.4	(a) Explain HIS color model in brief	03
	(b) Discuss the differences between lossless and lossy image compression techniques, focusing on the trade-offs between compression ratios and image quality.	04
	(c) Explore Smoothing frequency domain filters in detail, covering ideal lowpass filters, Butterworth lowpass filters, and Gaussian lowpass filters. Discuss their applications and potential challenges.	07
	OR	
Q.4	(a) What is the primary goal of image compression, and why is it essential in image processing and transmission?	03
	(b) List out color models. Explain RGB color model in brief.	04
	(c) Explore sharpening frequency domain filters in detail, covering ideal highpass filters, Butterworth highpass filters, and Gaussian highpass filters. Discuss their applications and potential challenges.	07

- Q.5** (a) Explain multiresolution expansion using wavelet function. **03**
(b) Discuss Haar transform in detail. **04**
(c) Discuss adaptive thresholding techniques in image segmentation and their advantages over fixed thresholding methods. Provide examples of applications where adaptive thresholding is particularly useful. **07**

OR

- Q.5** (a) Define image segmentation and explain its importance in image processing. **03**
(b) Explain the principles of edge detection and the methods used to detect edges in images. **04**
(c) Explain image pyramid in brief. **07**
