Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII EXAMINATION – WINTER 2025

Subject Code:3171109 Date:13-11-2025

Subject Name:Digital Image and Video 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)**	Grey level image has intensity range from 50 to 150. We need to display this image on a device that has grey level range of 0 to 255. Write equation of the transformation function suitable for the display.	**03**
	(b)	Suggest suitable method of reducing 256 gray levels image to 32 gray level image i.e. transformed image requires 5 bit per pixel instead of 8 bit per pixel	**04**
	(c)	Consider image size of 1024x768 having 65535 colors. What is transmission time required to transmit this image without compression using internet speed of 40 MBPS. What is the storage requirement in bytes for such 1000 images?	**07**
Q.2	**(a)**	What will be negative 4x4 digital image for the following 8 bit 3x3 digital image?	**03**

100	155	155	255
255	0	0	255
100	0	0	100
0	0	0	0

	(b)	In contrast stretching with piece-wise linear input-output characteristics having corner points (0,0) (50,150) (100,200) (150,200), (200,225) and (255,255). What will be Output pixel value for input pixel 25, 60, 75 and 200 ?	**04**
	(c)	Explain the principle of the Discrete Fourier Transform (DFT) and its importance in image processing. Include an example where DFT is used to filter out high-frequency noise from an image.	**07**
		OR	
	(c)	Explain the concept and application of non-linear filters in digital image processing. Discuss how a median filter is used for noise reduction of salt and pepper noise in images, comparing its effectiveness with linear filters under such noise conditions.	**07**
Q.3	**(a)**	Explain 4-adjacency, 8-adjacency and m-adjacency with example	**03**
	(b)	Explain concept of Euclidean distance, City block distance, Chessboard distance with example.	**04**
	(c)	Describe the process of image restoration and its difference from image enhancement. Provide a detailed example of restoring an image that has been degraded by salt and pepper noise.	**07**
		OR	

Q.3	**(a)**	For what type of noise Wiener filter is suitable? Explain key concepts of Wiener filter.	**03**
	(b)	Define histogram equalization and its purpose in image processing	**04**
	(c)	Explain Dilation and Erosion morphological image processing technique.	**07**
Q.4	**(a)**	What is the goal of image segmentation?	**03**
	(b)	How is the YUV color model different from RGB?	**04**
	(c)	Assess the effectiveness of lossy versus lossless compression methods on image quality.	**07**

OR

Q.4	**(a)**	What are I, P, and B frames in video coding?	**03**
	(b)	Define and give an example of the use of the Laplacian filter in image sharpening.	**04**
	(c)	Explain hit-or-miss transform with example	**07**
Q.5	**(a)**	Define video segmentation and briefly explain its significance in multimedia applications.	**03**
	(b)	What are the trade-offs between compression ratio and image quality in lossy compression?	**04**
	(c)	Explain concept wavelet transform with help of block diagram. How wavelet transform can be useful for multi resolution analysis of given digital image?	**07**

OR

Q.5	**(a)**	What is inter-frame redundancy in video coding?	**03**
	(b)	Explain the conversion process between RGB and HSI color models.	**04**
	(c)	What is video coding? Why video coding is required? Describe the role of motion compensation in MPEG video coding standards. Explain how motion vectors are utilized to reduce temporal redundancy and enhance compression efficiency in MPEG-encoded video sequences.	**07**

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