X/D/TZ

Reg. No: 24BHT0014

Final Assessment Test – April 2026

VIT® Vellore Institute of Technology

Course: BHST303L - Image Processing and Data Analysis

Class NBR(s): 0995 Slot: B1+TB1

Time: Three Hours Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

COs	CO Statements
CO1	Demonstrate an understanding of image acquisition, sampling and transformation
CO2	Ability to use image processing operators to restore or enhance corrupted images
CO3	Explain the effects and uses of the various image processing techniques on digital images
CO4	To align two or more images from different sources to create a unified view
CO5	Justify the choice of segmentation technique for application and describe the components of pattern recognition and explain their limitations.
CO6	Analyze images from various modalities for diagnostic application.

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

Answer ALL Questions

(10 X 10 = 100 Marks)

1.	Explain digital image fundamentals: sampling, quantization, pixel relationships.	CO1	BL2
2.	A low-contrast chest X-ray shows poor lung visibility. Develop MATLAB code implementing histogram specification (not just histeq) to match target histogram from normal lung image. Justify parameter choices for diagnostic improvement.	CO2	BL3
3.	Compare gray-level transformations vs histogram equalization for MRI contrast enhancement.	CO2	BL4
4.	List lossless compression techniques (arithmetic coding) and JPEG basics.	CO3	BL1
5.	Skin lesion image in RGB shows poor separation. Design MATLAB function converting to HSI space, implementing adaptive saturation thresholding based on local statistics (not global), overlay segmented regions. Why does HSI outperform RGB here?	CO3	BL4
6.(a)	Explain morphological operations: dilation, erosion, opening, closing with medical examples.	CO4	BL4
	OR		
6.(b)	Analyse co-occurrence matrix for texture classification in ultrasound tumors.	CO4	BL4
7.	Evaluate thresholding vs watershed segmentation for precise tumor boundary detection.	CO5	BL5

8.	Noisy retinal vessel image: Create MATLAB pipeline using adaptive Canny (tune sigma), anisotropic diffusion denoising first, then directional morphological linking + Hough circles. Justify each preprocessing step for vessel continuity.	CO5	BL4
9.(a)	Describe image registration types and rigid transformation models (MR/CT fusion).	CO6	BL3
	OR		
9.(b)	Justify volume rendering vs surface rendering for 3D CT visualization of fractures.	CO6	BL3
10.	Analyse X-ray processing pipeline: enhancement, segmentation, feature extraction for fracture detection.	CO6	BL4

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