Ref No: Ex/PG/ITE/PE/T/123A/2025

ME in INFORMATION TECHNOLOGY

1ST YEAR, 2ND SEMESTER EXAMINATION, 2025

COMPUTER VISION

Full Marks: 100 **Total Time: 3 hours**

CO1

[20 MARKS]

1. a) What do you mean by Computer Imaging? What are its various categories?

b) What do you mean by Image analysis? How can you express a digital image?

c) What are the types of sensors in human visual system? Where an object should be placed to perceive it in fine detail? What do you mean by blind spot?

d) Write a short note on Brightness Adaptation. What is Match Band effect?

[(2+2)+(2+2)+(2+2+2)+(4+2)=20]

CO2

[35 MARKS]

2. a) Suppose we have a grayscale image of digits and each image is reduced to 2D features labelled as Class A or Class B. Consider the following training dataset. Suppose a new point P6=(3.0, 3.0) has been introduced. How would you predict the label of this image using KNN algorithm.

Image ID	Feature 1	Feature 2	Digit Label
P1	1.0	2.0	A
P2	2.0	3.0	A
P3	3.0	1.0	B
P4	6.0	5.0	B
P5	7.0	7.0	B

b) Consider a 4x4 RGB image (16 pixels) where each pixel is 3D vector (R, G, B). How would you group these pixels into K=2 clusters. (background vs object)

Pixel	R	G	B
P1	255	0	0
P2	254	1	0
P3	0	255	0 (BLACK)
P4	0	254	1

c) Find the transformed data using 1D PCA for following set of given data.

	Sample	**X**	**Y**		
	A	2	0		
	B	0	2		
	C	3	1		[10+10+15=35]
CO3 **[30 MARKS]**	3. a) Consider the following 3x3 grayscale image. Detect if the given region has a corner, edge or flat area using Harris Corner detector. Use **Sobel Kernel** to compute.				
	y/x	**0**	**1**	**2**	
	0	10	10	10	
	1	100	200	10	
	2	10	10	10	
	Or,				
	Consider the following 3x3 grayscale image. Detect if the given region has a corner, edge or flat area using Harris Corner detector. Use **Difference Operator** to compute.				
		X=0	**X=1**	**X=2**	
	Y=0	100	100	100	
	Y=1	100	150	200	
	Y=2	100	200	250	
	b) Detect edges in a small grayscale 3x3 image using **Laplacian of Gaussian (LOG)** operator.				
	y\x	**0**	**1**	**2**	
	0	10	10	10	
	1	10	200	10	
	2	10	10	10	
					[15+15=30]
CO4 **[15 MARKS]**	4. a) Explain how Canny Edge detector algorithm works. b) Explain how Differential of Gaussian (DOG) algorithm works.				[7+8=15]

Course Outcomes:

CO1: Discuss the basic concepts, terminology, and various methods of computer vision.

CO2: Illustrate the methods of feature extraction and analyze the pattern.

CO3: Describe the different segmentation approaches and shape representations.

CO4: Discuss the various applications of computer vision.