

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3171614

Date:16-12-2024

Subject Name: Computer Vision

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 Radiometry, Give example of radiometry property in image processing.	03
	(b) Discuss the significance of affine transformations in image processing. Give two examples of affine transformations.	04
	(c) Describe the process of camera calibration and its importance in computer vision applications. Discuss the parameters involved in camera calibration and how they affect image formation.	07
Q.2	(a) Explain spatial filtering in image processing. Give application of any one spatial filter.	03
	(b) Explain pixel transforms in image processing and provide one example of a pixel transform operation.	04
	(c) Describe Fourier transformation and its role in image processing. Discuss its applications in sharpening, blurring, and noise removal, providing specific examples any two applications.	07
	OR	
	(c) Explain the process of convolution in image processing. Provide an example of a convolution operation and its application	07
Q.3	(a) Define corner detection and discuss its significance in computer vision tasks.	03
	(b) Compare and contrast the SIFT and HOG descriptors in feature detection	04
	(c) Discuss the differences between line and curve detection techniques in computer vision. Provide one example scenario where each technique is more suitable	07
	OR	
Q.3	(a) Explain edge detection in image processing. Provide one popular edge detection algorithm	03
	(b) Compare and contrast region splitting and region merging algorithms for image segmentation	04
	(c) Discuss mean shift and its role in image segmentation. Explain how mean shift clustering can be adapted for segmentation tasks.	07

Q.4	(a)	Differentiate between intrinsic and extrinsic parameters of a camera.	03
	(b)	Discuss radial lens distortion in camera calibration, provide one method to correct for radial distortion.	04
	(c)	Describe the Kalman filter and its role in motion tracking applications. Explain the underlying principles of the Kalman filter, including prediction and update steps.	07
OR			
Q.4	(a)	Describe the perspective camera model give advantages.	03
	(b)	Explain how observability affects the accuracy of tracking systems and provide one method to improve observability.	04
	(c)	List different camera models, Discuss their differences in terms of assumptions, applications, and limitations.	07
Q.5	(a)	Explain statistical filtering in motion tracking. Provide one example of a statistical filtering technique used for motion tracking.	03
	(b)	Write python or MATLAB code for reading and writing image.	04
	(c)	Explain the theory behind histogram equalization and Fourier transformation in image processing. Describe the underlying principles, assumptions, and mathematical operations involved in each technique	07
OR			
Q.5	(a)	Define motion parallax and explain its significance in motion representation.	03
	(b)	Write a python or MATLAB code for Image segmentation.	04
	(c)	Explain image eigenspaces in object recognition. Describe how image eigenspaces are computed and used for object recognition tasks	07
