GUJARAT TECHNOLOGICAL UNIVERSITY
## BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3171113   **Date:11-12-2024**
Subject Name: Practical aspects of 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)**	Enlist fundamental steps involved in Image Processing.	**03**
	(b)	Explain contrast stretching spatial domain operation on image.	**04**
	(c)	Consider the following figure 1:	**07**
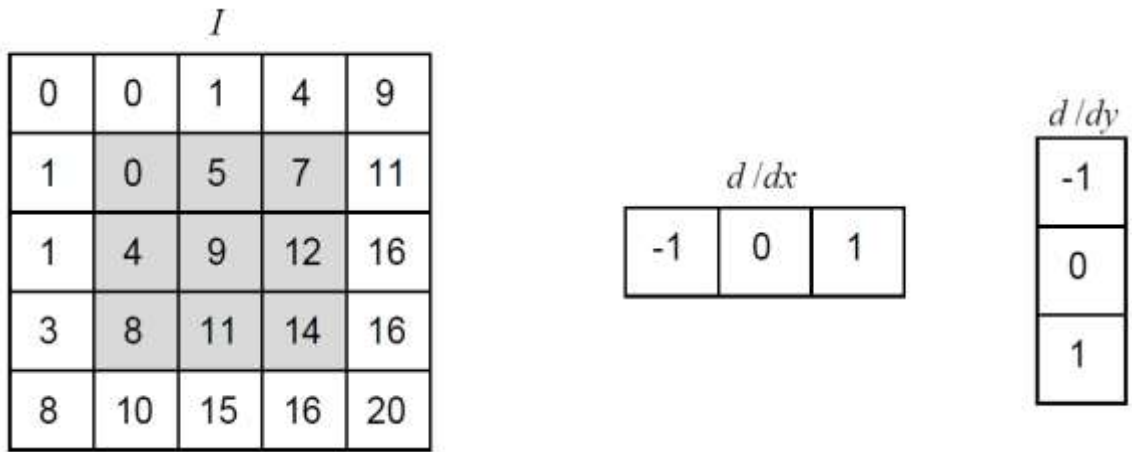
Compute the Harris matrix:

$$H = \sum_{(x,y) \in W} \begin{bmatrix} I_x(x,y)^2 & I_x(x,y)I_y(x,y) \\ I_x(x,y)I_y(x,y) & I_y(x,y)^2 \end{bmatrix}$$

for the 3 by 3 highlighted window. In the above formula Ix = dI/dx, Iy = dI/dy, and W is the window highlighted in the image.

Q.2	**(a)**	What do you mean by Image Mosaicing?	**03**
	(b)	Calculate the Harris corner score $C = \det(H) - k * trace(H)^2$ with $k = 0.04$ for the H matrix $H = \begin{bmatrix} 403 & 385 \\ 385 & 381 \end{bmatrix}$. Based on the computed value of C, determine whether it represents a corner, an edge or a flat area. Provide justification for your answer.	**04**
	(c)	Discuss basic steps in image filtering in frequency domain.	**07**
		OR	
	(c)	Explain Scale Invariant Feature Transform.	**07**
Q.3	**(a)**	Define a corner in an Image.	**03**
	(b)	Explain forward mapping and reverse mapping in Image Warping.	**04**
	(c)	Write a short note on homography and also explain direct linear transformation also.	**07**

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OR

Q.3	**(a)**	Write a note on Pin Hole camera.	**03**
	(b)	State different limitations of a pinhole camera and how to overcome these limitations.	**04**
	(c)	Explain translation and rotation about X, Y and Z axis on an image in detail.	**07**

Q.4	**(a)**	Write any three applications of Optical Character Recognition (OCR).	**03**
	(b)	Discuss Pros and Cons of K – nearest Neighbours Algorithm.	**04**
	(c)	Explain the significance of Principal Component Analysis (PCA) technique for dimensionality reduction of large dataset.	**07**

OR

Q.4	**(a)**	State three types of kernel functions with equations used in SVM.	**03**
	(b)	Discuss advantages and disadvantages of SVM.	**04**
	(c)	Write down steps of PCA algorithm.	**07**

Q.5	**(a)**	If you possess an extensive image database with diverse classes, what are two methods to search for a specific image class within the database?	**03**
	(b)	What do you mean by clustering? Also explain k-means clustering.	**04**
	(c)	Explain Content Based Image Retrieval (CBIR).	**07**

OR

Q.5	**(a)**	State whether the following statement is true or false and provide a justification for your answer: "Clustering approach belongs to the supervised learning approach."	**03**
	(b)	State two types of similarity measures used in hierarchical clustering.	**04**
	(c)	Explain the principle of k-means clustering.	**07**

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