PRESIDENCY UNIVERSITY
GAIN MORE KNOWLEDGE REACH GREATER HEIGHTS
BENGALURU

School of Computer Science and Engineering
Mid - Term Examinations - November 2024

Semester: V   **Date**: 04/11/2024

Course Code: CSE3071   **Time**: 02.00pm to 03.30pm

Course Name: Computer Vision   **Max Marks**: 50

Program:BTech   **Weightage**: 25%

Instructions:
   (i) Read all questions carefully and answer accordingly.
   (ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.   **5Qx2M=10M**

1	Define Computer vision.	**2 Marks**	**L1**	**CO1**
2	List out the applications of computer vision.	**2 Marks**	**L1**	**CO1**
3	Identify major steps involved in image digitization.	**2 Marks**	**L1**	**CO1**
4	List out the difference between image enhancement and image denoising.	**2 Marks**	**L1**	**CO2**
5	Name the command used for reading an image and displaying an image matrix.	**2 Marks**	**L1**	**CO2**

Part B

Answer ALL Questions. Each question carries 10 marks.   **4QX10M=40M**

6	6a.	Explain sampling and quantization with an neat diagram?	**5 Marks**	**L2**	**CO1**
	6b.	Discuss digital image filters with an example.	**5 Marks**	**L2**	**CO1**

Or

7	7a.	Describe the process of resizing an image and its importance in applications.	**5 Marks**	**L2**	**CO1**

	7b.	Explain spatial domain filtering and give an example of where it's used	**5 Marks**	**L2**	**CO1**
8	**8a.**	Explain image restoration and its importance in medical imaging.	**5 Marks**	**L2**	**CO1**
	8b.	Explain how the Sobel operator works in edge detection and describe the purpose of its horizontal and vertical kernels.	**5 Marks**	**L2**	**CO1**

Or

9	**9a.**	Describe image sharpening using laplacian mask derive the mask using first order and second order derivative.	**5 Marks**	**L2**	**CO1**
	9b.	Discuss a scenario where you would prefer using the Canny edge detector over the Sobel or Prewitt operators. Justify your choice based on the characteristics of the algorithm.	**5 Marks**	**L2**	**CO1**
10		Apply Laplacian filter 1st order and second order derivative on given image scan line and draw the graph to interpret the edges.	**10Marks**	**L3**	**CO2**

Scan line: | 6 | 6 | 6 | 6 | 5 | 4 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 6 | 6 | 6 | 6 | $\rightarrow x$

Or

11		Apply split and merge segmentation on Given 4x4 grayscale image matrix with intensity values ranging from 0 to 255: 100 102 105 107 101 104 106 109 150 152 155 157 151 153 158 160 Assume that the criterion for splitting and merging is based on the intensity range within each region: • If the intensity range within a region exceeds 10, the region should be split. • If adjacent regions have a difference in mean intensity of 5 or less, they should be merged.	**10Marks**	**L3**	**CO2**
12	**12a.**	Explain histogram equalization and its steps in detail.	**4 Marks**	**L3**	**CO2**

	12b.	Perform histogram equalization mapping
		Consider the following 3x3 grayscale image matrix:
		   0 2 2
		   3 3 4
		   4 5 6
		1. Calculate the histogram of this image and its CDF.
		2. Map each intensity value to a new level through histogram
			6 Marks	**L3**	**CO2**

equalization so that the intensity levels spread uniformly across the available range.
3. Form the new equalized 3x3 matrix.

Or

| 13 | Histogram Equalization for Uniform Distribution | **10 Marks** | **L3** | **CO2** |

For the following 4x3 grayscale image matrix with pixel values from 0 to 3:

```
0  1  2
1  1  2
2  3  3
3  2  3
```

Compute the histogram of the image and the cumulative distribution.
1. Equalize the histogram so that the new intensity values have a uniform distribution.
2. Update the pixel values to create the equalized matrix.
3. Verify that the final histogram has approximately equal frequencies for each intensity level.