Register No: ……………………   Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)
(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)
EIGHTH SEMESTER B.TECH DEGREE EXAMINATION(R), MAY 2024
Robotics and Automation
(2020 SCHEME)

Course Code	:	**20RBT412**
Course Name	:	**MACHINE VISION**
Max. Marks	:	**100** **Duration:3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. Illustrate the purpose of a lens in camera.

2. Discuss the advantages of Camera Link for high-resolution imaging applications.

3. Provide the mathematical expression for the 2D Discrete Fourier Transform of an image f(x,y).

4. Define Affine transformations in the context of computer graphics and image processing.

5. Describe the nearest-neighbor interpolation algorithm used for image resizing.

6. Write the importance of image segmentation in computer vision applications.

7. Describe the fundamental principles and methodologies utilized for object detection in the context of image processing.

8. Define the edge-based approach to image segmentation and discuss its relevance in computer vision applications.

9. Define Principal Component Analysis (PCA) and explain its purpose in dimensionality reduction.

10. Differentiate clustering and classification in image processing.

PART B
(Answer one full question from each module, each question carries 14 marks)
MODULE I

11. a) Illustrate the working of a CMOS camera.   7
    b) Explain the following with necessary diagrams i) Gaussian optics ii) Depth field.   7

OR

12. a) Compare and contrast the IEEE 1394, USB 2.0, and USB 3.0 Vision interfaces.   6
    b) Explain the working mechanism of a three-chip camera used in imaging technology with necessary diagram.   8

MODULE II

13. a) Describe the operational principles of smoothing and sharpening filters and their respective applications.   8
    b) Enumerate the various image enhancement methods in the spatial domain.   6

OR

14. a) Describe the concept of sharpening filters based on first and second derivatives in image enhancement.   8

b) Explain the significance of the Sobel filter in image enhancement. 6

MODULE III

15. a) Differentiate between basic global thresholding and basic adaptive thresholding used for partitioning images. 6

b) Describe the different morphological operations used in digital image processing. 8

OR

16. a) Interpret the Canny edge detection algorithm. 9

b) Explain how smoothing techniques are utilized to mitigate aliasing challenges in image enhancement. 5

MODULE IV

17. Illustrate the operation of mean-shift and graph-cut method in image processing. 14

OR

18. Analyze the principles of region-based segmentation techniques such as region growing, region splitting and split and merge with examples in the context of image processing. 14

MODULE V

19. a) Define supervised, unsupervised and semi-supervised learning. List the key differences between these three types of learning paradigms. 9

b) Describe the K-nearest neighbors (KNN) algorithm. 5

OR

20. Describe the operational principles and applications of K-Nearest Neighbors (KNN) and Artificial Neural Network (ANN) models in the field of machine learning. 14

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