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Question Paper Code	13102
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024
 Fifth Semester
Artificial Intelligence and Data Science
20AIPC501 - COMPUTER VISION
 Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. Which of the following is not a fundamental task in computer vision? (a) Object detection (b) Image classification (c) Speech recognition (d) Image segmentation	1	K1	CO1
2. CCD stands for..... (a) charged coupled detector (b) charged coupled device (c) charging coupled device (d) None of the mentioned	1	K1	CO1
3. 0 represents the background and 1 represents the foreground in..... (a) Image Analysis (b) Binary Image Analysis (c) All of the mentioned (d) None of the mentioned	1	K1	CO1
4. Linear filtering is a technique used in image processing to: (a) Enhance image sharpness (b) Adjust image brightness (c) Reduce image noise (d) Change image colors.	1	K1	CO2
5. Pick out the incorrect statement about histogram equalization: (a) Histogram equalization can improve the visual quality of images (b) It can enhance the appearance of dimly lit areas in an image (c) Histogram equalization is only useful for grayscale images (d) It can be applied to both low- and high-contrast images	1	K1	CO2
6. A _____ filter is commonly used to blur or smooth an image. (a) Gaussian (b) Median (c) Laplacian (d) Sobel	1	K1	CO2
7. Identify the primary purpose of using HOG features in image analysis. (a) To enhance the color intensity of images. (b) To detect edges and corners in digital images. (c) To classify images based on their texture. (d) To capture the distribution of directions (orientations) of gradients.	1	K1	CO3
8. SIFT stands for Scale-Invariant Feature _____. (a) translation (b) transform (c) transfer (d) transaction	1	K1	CO3
9.vision includes process image for feature extraction. (a) Low-level (b) Middle vision (c) High vision (d) None of the mentioned	1	K1	CO3
10. Which technique is often used to improve the performance of graph cuts in practical applications? (a) Approximate algorithms (b) High-pass filtering (c) Color quantization (d) Edge detection	1	K1	CO4
11. What is the main limitation of graph cuts in large-scale image processing? (a) They require extensive manual tuning. (b) They can be computationally expensive for large graphs. (c) They do not handle color images well. (d) They cannot be used for real-time applications.	1	K1	CO4
12. The RetinaNet model introduced in became one of the best models with single-shot object detection capabilities. (a) 2016 (b) 2017 (c) 2015 (d) 2013	1	K1	CO4

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|--|--|----|-----|
| 13. How can a Bayesian network be used to answer any query? | 1 | K1 | CO5 |
| (a) Full distribution | (b) Joint distribution | | |
| (c) Partial distribution | (d) All of the mentioned | | |
| 14. What does the Bayesian network provide? | 1 | K1 | CO5 |
| (a) Complete description of the domain | (b) Partial description of the domain | | |
| (c) Complete description of the problem | (d) None of the mentioned | | |
| 15. What type of clustering is sensitive to the initial choice of clusters? | 1 | K1 | CO5 |
| (a) Hierarchical clustering | (b) K-means clustering | | |
| (c) DBSCAN clustering | (d) Naive Bayes clustering | | |
| 16. What is a future trend in clustering that aims for improved performance by integrating with machine learning techniques? | 1 | K1 | CO5 |
| (a) Using shallow learning algorithms | (b) Leveraging deep learning | | |
| (c) Applying traditional statistics methods | (d) Relying solely on heuristic approaches | | |
| 17. Parametric motion estimation is primarily used to: | 1 | K1 | CO6 |
| (a) Determine the intensity of pixels in an image | | | |
| (b) Match the following frames in a video sequence | | | |
| (c) Analyze color variations in an image | | | |
| (d) Apply artistic effects to an image | | | |
| 18. What is the main goal of motion tracking in parametric motion estimation? | 1 | K1 | CO6 |
| (a) Enhancing image quality | | | |
| (b) Analyzing motion patterns | | | |
| (c) Tracking the movement of objects in a video | | | |
| (d) Estimating the camera motion in a video sequence | | | |
| 19. What is layered motion in the context of image processing? | 1 | K1 | CO6 |
| (a) A technique to estimate the depth of objects in a scene | | | |
| (b) A method to segment images based on their color information | | | |
| (c) A process to decompose motion into distinct layers or components | | | |
| (d) A transformation to adjust the perspective distortion in images | | | |
| 20. Which of the following is a common challenge in 3D object recognition? | 1 | K1 | CO6 |
| (a) Illumination changes | (b) Limited processing power | | |
| (c) Low-resolution images | (d) Lack of labeled training data | | |

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

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| 21. Compare CCD and CMOS sensors. | 2 | K2 | CO1 |
| 22. What is Computer vision? | 2 | K1 | CO1 |
| 23. Define affine transformation. | 2 | K1 | CO2 |
| 24. List the different types of derivative filters. | 2 | K1 | CO2 |
| 25. Summarize the properties of Scale-Space Analysis. | 2 | K2 | CO3 |
| 26. State Key point Matching. | 2 | K1 | CO3 |
| 27. Define min-cut. | 2 | K1 | CO4 |
| 28. Explain kernel density Estimation. | 2 | K2 | CO4 |
| 29. Outline the process for partitioning an image. | 2 | K2 | CO5 |
| 30. Name the issues that have to be considered in order to define a motion representation. | 2 | K1 | CO6 |

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

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|---|----|----|-----|
| 31. a) Explain pinhole and perspective projection and weak perspective in detail. | 10 | K2 | CO1 |
| OR | | | |
| b) Describe the various types of image sensor in detail. | 10 | K2 | CO1 |

32. a) Explain Affine and Projective transformation in detail. 10 K2 CO2

OR

- b) Explain histogram and apply histogram equalization to the following image. 10 K2 CO2

$$F(x,y) = \begin{matrix} \begin{matrix} 1 & 2 & 1 & 1 & 1 \\ 2 & 5 & 3 & 5 & 2 \\ 2 & 5 & 5 & 5 & 2 \\ 2 & 5 & 3 & 5 & 2 \\ 1 & 1 & 1 & 2 & 1 \end{matrix} \\ \text{Input Image} \end{matrix}$$

33. a) Discuss the Speeded up robust features (SURF) and its steps in detail. 10 K2 CO3

OR

- b) Explain GHT in detail and using Hough Transform that the following points are collinear. Also find the equation of the line (1,2), (2,3) & (3,4). 10 K2 CO3

34. a) Outline the procedure for region splitting with an example in detail. 10 K2 CO4

OR

- b) Explain hill climbing using Mean-Shift algorithm in detail. 10 K2 CO4

35. a) Demonstrate the clustering concept of K-means with an example. 10 K2 CO5

OR

- b) Illustrate Principal Component Analysis in detail with an example. 10 K2 CO5

36. a) Explain 3D object recognition in detail. 10 K2 CO6

OR

- b) Explain the concepts of 3D reconstruction in detail. 10 K2 CO6