No. of Printed Pages : 6

MCS–230

MASTER OF COMPUTER APPLICATIONS (MCA)

Term-End Examination

December, 2025

MCS–230 : DIGITAL IMAGE PROCESSING AND COMPUTER VISION

Time : 3 Hours *Maximum Marks : 100*

Note : *Question No.* ***1*** *is compulsory. Attempt any* ***three*** *questions from the rest. Use of scientific calculator is allowed.*

1. (a) What do you mean by Image Acquisition ? Explain the various types of imaging and data acquisition systems. 8

(b) Explain the significance of image enhancement in the spatial domain. Provide detailed explanations of at least *three* common techniques used for image enhancement, and elucidate how these techniques operate to improve the visual quality of an image. Include real-world examples to illustrate their effectiveness. 8

(c) Discuss the evolution and recent advancement in computer vision technology. Highlight key breakthroughs that have shaped the field, such as Deep Learning. Explain how these advancements have improved the capabilities of both single and multi-camera systems, leading to more robust and sophisticated applications in fields like autonomous vehicles, robotics and healthcare. 8

(d) What are the different categories of supervised learning algorithms ? Discuss any *five* differences between supervised and unsupervised machine learning techniques. 8

(e) Compare low-pass and high-pass frequency domain filters. How do these filters affect the frequency content of an image, and what are their respective applications in image processing ? 8

2. (a) Compare the Discrete Fourier Transform, Discrete Cosine Transform, and Discrete Wavelet Transform. Highlight the strengths and weaknesses of each transform in terms of their applications, computational efficiency and ability to represent different types of signals or images. 8

(b) Explain the following : 4

(i) Gaussian noise

(ii) K-means clustering

(c) Explain various colour models for image processing. 8

3. (a) Explain the role of labelled datasets in supervised learning for object recognition. How does the quality and quantity of labelled data impact the performance of the recognition model ? 7

(b) What is digital image processing ? How does it differ from traditional image processing techniques ? 5

(c) What is meant by Laplacian filter ? Using a second derivative, develop a Laplacian mask for image sharpening. 8

4. (a) What do you mean by Wiener filter in signal processing ? What problems does the Wiener filter aim to solve, and how does it operate in both the time and frequency domains ? 10

   (b) What is Homography ? Discuss the application of Homography in computer vision and image processing. 5

   (c) Describe Agglomerative Hierarchical clustering. 5

5. Write short notes on any *five* of the following : 4×5=20

   (i) Camera calibration

(ii) Edge-based Segmentation

(iii) Bayesian classification

(iv) Smoothing filters

(v) Partition clustering

(vi) Applications of feature extraction

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