No. of Printed Pages : 8

MCS–230

MASTER OF COMPUTER APPLICATIONS (MCA)

Term-End Examination

June, 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 Images Digitization ? Explain the role of sampling and quantization in process of

digitization, with suitable example for each. 10

(b) Elaborate on the key steps involved in a digital image processing pipeline, from the acquisition of an image to the final output. Include discussion on preprocessing, image enhancement, image transformation and the role of mathematical operations in these processes. 10

(c) Discuss the significance of image representation in digital image processing. How do different colour models, such as RGB and CMYK, impact the way images are stored and processed ? Provide insights into the

advantages and limitations of these models. 10

(d) Compare true colour images and monochromatic images. 5

(e) What do you understand by the term "Brightness of Images" ? How is it different from the contrast of any image ? 5

2. (a) Discuss the significance of unitary transformations in the processing of 2-D signals, particularly images. Explain the properties of unitary transformations and how they preserve the inner product of vectors. Give examples of unitary transformations

applied to images, emphasizing their role in preserving information while enabling efficient processing and analysis. 7

(b) What do you mean by Discrete Fourier Transform (DFT) ? Explain how the DFT is computed for 2-D images, and discuss the significance of understanding the frequency content of images in tasks such as image enhancement and restoration. 5

(c) Discuss the advantages and limitations of Haar transformation compared to other transformation methods, such as

Fourier or cosine transformations. Also explain scenarios where Haar transformation is particularly well-suited and provide insights into its applications in image compression, denoising, and feature extraction. 8

3. (a) Explain the following : 8

(i) Color image enhancement techniques

(ii) Role of filtering in image enhancement

(b) What do you mean by camera configuration in influencing depth perception in computer vision systems ? Compare and contrast the depth

perception capabilities of single-camera and multiple camera models, considering factors such as camera placement, calibration, and the impact on accurate spatial representation. 8

(c) Briefly discuss about "Pin-Hole" camera model. 4

4. (a) Explain how the integration of feature extraction techniques enhances the accuracy of object detection in computer vision. 5

(b) Compare and contrast the trade-offs associated with different edge detection algorithms. Provide insights into how

the choice of edge detection techniques can be tailored to specific applications. 7

(c) Explain the significance of region detection in the context of image segmentation. Also discuss the challenges and importance of accurately identifying and delineating regions within an image. Provide examples of applications where region detection plays a crucial role, such as scene understanding, or object recognition. 8

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

(a) Supervised learning

(b) Clustering

(c) K-means clustering

(d) Cosine transformation

(e) Stereovision

(f) Region detection

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