

**MASTER OF COMPUTER APPLICATIONS
(MCA-NEW)**

Term-End Examination

December, 2022

**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 calculation is allowed)*

1. (a) Differentiate between Analog Image and Digital Image. Also, explain the term Image File Format. Mention some of the frequently used image file formats. 8
- (b) How does digital image relate to signals ? Give definition of 1-D and 2-D signals and explain how a 2-D image is expressed in terms of 2-D signals. 8
- (c) Explain Discrete Fourier Transform (DFT). Your explanation must include the properties of DFT. Construct a DFT matrix of Order 2. 8

- (d) Compare Image Enhancement with Image Restoration. Explain the term “Image Degradation” and define the various types of degradations in any image. 8
- (e) What is a Discriminant Function ? Compare Linear Discriminant function with Quadratic Discriminant function. Give properties and utility of Linear Discriminant function. 8
2. (a) Compare Sampling and Quantization in context of image digitization. Also, state Shannon-Nyquist theorem and discuss its role in sampling process of any image. 7
- (b) If the physical size of a medical image is 8×8 inches and the sampling resolution is 5 cycles/mm, then how many pixels per cycle are required to have a better quality image ? Will an image of size 256×256 be enough ? 5
- (c) Explain the term “Contrast Stretching.” How does contrast stretching contribute to image enhancement ? Also, discuss the fundamental characteristics of image, i.e., contrast, brightness and intensity. 8

3. (a) Explain Haar transform, with suitable example. Compute the discrete Haar transform of a 2×2 matrix, given $N = 2$. 7
- (b) Explain how image enhancement is better in the frequency domain as compared to spatial domain. Differentiate between image smoothening filters and image sharpening filters. 8
- (c) Explain RGB model, with suitable diagram. 5
4. (a) Explain Euclidean Distance Classifier. Write the assumptions under which it turns out that optimal Bayesian classifier is equivalent to minimum Euclidean distance classifier. 7
- (b) Differentiate between the following clustering methods : 8
- (i) Hierarchical and Non-Hierarchical methods
- (ii) Agglomerative and Divisive methods
- (c) Describe the following quantities used to represent any colour : 5
- (i) Chromaticity
- (ii) Intensity

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

- (a) Image representation using pixel model
 - (b) Binary images
 - (c) Intensity resolution
 - (d) Butterworth low-pass filter
 - (e) Salt and Pepper noise
 - (f) Mean filters
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