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3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : **10**

a) Define a 'Pixel' in the context of digital images.

b) List any two image file formats commonly used in image processing.

c) State the purpose of image smoothing.

d) List the three types of redundancy found in digital images.

e) Define Image Restoration and state its primary goal.

f) Define Texture Analysis in image processing.

g) List two object detection algorithms.

Marks

2. Attempt any THREE of the following : **12**

a) Explain the 2-D Discrete Fourier Transform (DFT) in the frequency domain.

b) Differentiate between Image Sampling and Image Quantization.

c) Explain Run Length Coding with a simple example.

d) Describe the Gaussian Noise and Uniform Noise models.

3. Attempt any THREE of the following : **12**

a) Explain the importance of Shape Analysis and name the types of shapes.

b) List four real-world applications of Image Restoration.

c) Compare Point Detection and Line Detection techniques.

d) Explain the Log Transformation used in basic gray level transformations.

4. Attempt any THREE of the following : **12**

a) Describe the concept and importance of Histogram Equalization.

b) List and briefly describe any four applications of Digital Image Processing.

c) Explain the difference between Image Restoration and Image Enhancement.

d) Describe the basic objectives of the JPEG compression standard.

e) Describe the components of an Object Recognition System.

Marks

5. Attempt any TWO of the following : **12**

a) Draw and explain the block diagram showing the fundamental steps in Digital Image Processing.

b) Explain Homomorphic filtering and how it is used for image enhancement.

c) Discuss an overview of Deep Learning and Convolutional Neural Networks (CNNs) in modern image analysis.

6. Attempt any TWO of the following : **12**

a) Differentiate between Arithmetic Mean Filter, Geometric Mean Filter, and Harmonic Mean Filter.

b) Elaborate on Color Feature Extraction methods, specifically Color Histogram and Color Moments.

c) Discuss Edge Detection using the Prewitt and Sobel operators.
