

(2 1/2 Hours)

[Total Marks: 75]

- N.B. 1) All questions are compulsory.
 2) Figures to the right indicate marks.
 3) Illustrations, in-depth answers and diagrams will be appreciated.
 4) Mixing of sub-questions is not allowed.

Q. 1 Attempt All

(a) Select the correct alternative from the options given:

(10M)

- (i) Which of the following transform is separable?
 (a) Fourier transform (b) DFT
 (c) Walsh transform (d) Haar transform
- (ii) The photosensitive detector of the human eye is the _____.
 (a) Retina (b) Cornea
 (c) Iris (d) Eyelens
- (iii) Which of the following two values used by Walsh function.
 (a) +1 or -1 (b) $\sqrt{2}$ or $-\sqrt{2}$
 (c) $1/\sqrt{2}$ or $-1/\sqrt{2}$ (d) -2 or +2
- (iv) Increase the size of the mask results in _____ of the image.
 (a) Less blurring (b) More blurring
 (c) Improvement (d) Sharpening
- (v) Erosion operation is used to remove the _____ pixels.
 (a) Object (b) Background
 (c) Foreground (d) Image
- (vi) An image can be expanded by _____ operation.
 (a) Zooming (b) Dilation
 (c) Erosion (d) Subtraction
- (vii) _____ are memory less operations.
 (a) Mask operations (b) Global operations
 (c) Point operations (d) Dynamic operations
- (viii) A gradient operator for edge detection is _____.
 (a) Roberts (b) First order derivative
 (c) Second order derivative (d) Zero crossing derivative
- (ix) Compressed image can be recovered back by _____.
 (a) Image enhancement (b) Image contrast
 (c) Image decompression (d) Image recovery

- (x) Zigzag scan is employed in _____
- (a) Lossless compression (b) Jpeg compression
(c) Lossy compression (d) Statistical compression
- (b) Fill in the blanks by selecting from the pool of options: (5M)
(pixel, mask, printers, monitors, periodic, exponential, Intensity, Frames, Robert operator, Prewitt operator)
- (i) Structuring element is a _____.
- (ii) Additive colour formation is employed in _____.
- (iii) $X(n_1, n_2) = x(n_1 + N, n_2)$ is equation used for _____ sequence.
- (iv) Every run length pair introduces new _____.
- (v) Classical edge detector uses _____.

Q. 2 Attempt the following (Any THREE) (15M)

- (a) Describe the KL transform.
- (b) Perform the 2D linear cross correlation process on the following matrices.
 $x_1(m, n) = \begin{bmatrix} 3 & 1 \\ 2 & 4 \end{bmatrix}$ $x_2(m, n) = \begin{bmatrix} 1 & 5 \\ 2 & 3 \end{bmatrix}$
- (c) Explain the image sampling and image quantization process.
- (d) List and explain the classification of the 2D system.
- (e) What are the applications of Digital Image Processing? (any five)
- (f) Discuss Hadamard transform. Derive Hadamard matrix for $N=8$.

Q. 3 Attempt the following (Any THREE) (15M)

- (a) Discuss following colour models.
i) CMYK model
ii) HIS model
- (b) List different ways to obtain binary image using different enhancement technique. Explain any two of them.
- (c) Perform Histogram equalization on following matrix.
4 4 4 4 4
3 4 5 4 3
3 5 5 5 3
3 4 5 4 3
4 4 4 4 4
- (d) Describe the Alpha blending. Compare Alpha blending with image arithmetic.
- (e) Explain Gaussian filter with reference to image enhancement.

- (f) Explain morphological operations on the binary image.
Discuss following colour models.
- i) CMYK model
 - ii) HIS model

Q. 4 Attempt the following (Any THREE) (15)

- (a) Discuss the various algorithm used for edge linking through Heuristic approach.
- (b) Explain the region splitting and merging approach in Image Segmentation.
- (c) What is Partitional clustering? Compare K-means clustering and Fuzzy clustering.
- (d) Generate the non binary Huffman code for the word 'COMMITTEE'.
- (e) Write a note on Transform based compression.
- (f) Describe the classification of redundancy.

Q. 5 Attempt the following (Any FIVE) (15)

- (a) Write a note on Line Impulse sequence.
- (b) What is resolution? Explain two types of resolution.
- (c) Describe Negative transformation.
- (d) What is distance transform? Explain Euclidean distance.
- (e) Explain human perception of colour.
- (f) List various JPEG mode. Explain any two modes of it.
- (g) Draw and explain any three types of edges.
- (h) Discuss Laplacian of Gaussian.

$$\begin{array}{r} 0.11 \\ 9 \overline{) 10} \\ \underline{-9} \\ 10 \end{array}$$

$$\begin{array}{r} 0.22 \\ 9 \overline{) 20} \\ \underline{-18} \\ 2 \end{array}$$

$$\begin{array}{l} 0.2 \} 4 \\ 0.2 \} 7 \\ 0.4 \} 7 \\ 0.3 \} 16 \\ 0.8 \} \\ 0.8 \} \end{array} \quad \left. \begin{array}{l} \\ \\ \\ \\ \end{array} \right\} - 23$$