(2 ½ 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(n1,n2)=x(n1+N, n2) 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.

x1(m,n)=[3 1 x2(m,n)=[1 5
2 4] 2 3]

(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 perceptron 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.

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