

(3 Hours)

[Total Marks : 100

- N.B.:
- (1) Question No. 1 is compulsory.
 - (2) Attempt any four out of remaining six questions.
 - (3) Assume suitable data wherever necessary and state it.
 - (4) Figures to the right indicate marks.

1. Justify/contradict following statements :— 20
- (a) If Kernel of an image transform is separable and symmetric, the transform can be expressed in matrix form.
 - (b) Walsh transform is nothing but sequency ordered Hadamard matrix.
 - (c) Laplacian is good edge detector.
 - (d) Mixed adjacency is introduced to eliminate the ambiguities that often arise when 8-adjacency is used.

2. (a) Write differences between spatial and tonal resolution. 6
 (b) Equalize the following histogram. 8

GL.	0	1	2	3	4	5	6	7
No. of pixels	100	90	50	20	0	0	0	0

- (c) State and prove separable property of DFT. 6
3. (a) Using graph Theoretical Approach, find the edge for following 3X3 image starting from first row and ending on last row. 10

$$\begin{bmatrix} 5 & 6 & 7 \\ 3 & 4 & 2 \\ 0 & 1 & 7 \end{bmatrix}$$

Find the edge corresponding to minimum cost path.

- (b) Name and explain different types of redundancies in a digital image. 8
- (c) Classify the following compression techniques into lossy and loss less. 2
 - (i) IGS
 - (ii) Run length coding
 - (iii) Transform coding
 - (iv) DPCM

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4. (a) Explain basic principles of detecting following in the images 10
- (i) Points
 - (ii) Lines
 - (iii) Edges

Give 3X3 mask for each of them and explain their operation.

- (b) Explain dynamic range compression. 5
- (c) What is IGS Coding? How it is useful in data compression? 5

5. (a) Given below is the table of 8 symbols and their frequency of occurrence. 10

Symbol	s_0	s_1	s_2	s_3	s_4	s_5	s_6	s_7
Frequency	0.25	0.15	0.06	0.08	0.21	0.14	0.07	0.04

Give Huffman code for each eight symbols

Calculate entropy of the source

Find its average length

Calculate the efficiency of the code obtained in 5(a).

- (b) Explain why Huffman coding is not unique. 5
- (c) Compare histogram equalization and contrast stretching. 5

6. (a) Obtain 2D Hadamard Transform of the image segment shown below. 5

2	1	0	3
1	1	2	3
2	4	0	3
1	1	1	1

- (b) Explain Homomorphic filtering in detail. 5
- (c) Encode the following by using Arithmetic coding {a, b, b, c, c} 10

7. Write short note on any **three** of the following :— 20

- (a) Image compression model
- (b) Image degradation model
- (c) Image enhancement in frequency domain
- (d) DCT and its application in image processing.