

N.B. (1) Question No. 1 is **compulsory**.

- (2) Attempt any **four** questions from remaining **six** questions.
 (3) Assume **suitable** data if **necessary**, with proper **justification**.

1. (a) Explain uniform and non-uniform sampling. 20
 (b) List the applications of IP and explain any two in detail.
 (c) Explain with Isopreference curves — 'How Quality of picture varies as a function of the number of pixels and number of gray levels that represent the picture'.
 (d) Explain Region splitting and merging.

2. (a) Suppose that 8×8 pixel image is represented by 4 bits/pixel has the following gray level distribution. 8

| | | | | | | | | |
|--------------|---|-----|-----|-----|-----|-----|-----|-----|
| Gray level | 0 | 1/7 | 2/7 | 3/7 | 4/7 | 5/7 | 6/7 | 7/7 |
| No. of pixel | 4 | 16 | 17 | 11 | 8 | 4 | 4 | 0 |

Modify the above histogram such that the desired distribution is as follows :—

| | | | | | | | | |
|--------------|---|-----|-----|-----|-----|-----|-----|-----|
| Gray level | 0 | 1/7 | 2/7 | 3/7 | 4/7 | 5/7 | 6/7 | 7/7 |
| No. of pixel | 2 | 6 | 8 | 10 | 12 | 11 | 9 | 6 |

- (b) Explain convolution in the spatial domain and the frequency domain. Derive the relationship between the two domains. 6
 (c) Explain in brief frequency domain enhancement techniques. 6

3. (a) Using 4-point FFT algorithm, evaluate 2-D DFT of the following image :— 10

| | | | |
|---|---|---|---|
| 0 | 1 | 2 | 1 |
| 1 | 0 | 1 | 2 |
| 2 | 1 | 0 | 1 |
| 1 | 2 | 1 | 0 |

- (b) Explain Fast Hadamard transform. 10

4. (a) Detect the boundary and segment of the given image using graph theoretical approach. 8
 Also draw the graph for the given image.

$$\text{Image} = \begin{pmatrix} 7 & 2 & 2 \\ 5 & 7 & 2 \\ 5 & 1 & 0 \end{pmatrix}$$

- (b) Write short note on Hough transform. 8
 (c) Explain a threshold finding algorithm for Global thresholding. 4

5. (a) Explain in detail image compression using LZW method. 8
(b) Explain Fidelity Criteria w.r.t. image compression. 4
(c) Briefly explain the following variable length codes : 8
 (i) Truncated Huffman
 (ii) B_2 code
 (iii) Binary shift
 (iv) Huffman shift.
6. (a) Explain how skelton of a region can be obtained via. Medial Axis Transformation, 8
 with suitable algorithm.
(b) Find the medial axis of — 4
 (i) a circle (ii) an equilateral triangle.
(c) Explain morphological Hit or Miss transform with a suitable example. 8
7. Write short notes on :— 20
 (a) Bit plane slicing with one application (c) JPEG encoder and decoder
 (b) Karhunen-Loeve Transform (d) Lossy predictive coding.
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