



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain the fundamental steps in digital image processing with neat block diagram. **7**
 - b) Write a short note on Image Sampling and Quantization. **7**
- OR**
2. a) What are different distance measures used for image? Compute D_e , D_4 and D_8 distance between two pixels p and q in the image shown below : **8**

$$\begin{array}{cccc}
 & & & (q) \\
 & 0 & 1 & 1 & 1 \\
 & 1 & 0 & 0 & 0 \\
 & 1 & 1 & 1 & 1 \\
 (p) & 1 & 1 & 0 & 1
 \end{array}$$

- b) Define the term 4-, 8- and m - path between two points p and q in an image. Give the example. **6**
3. a) Write short note on Histogram equalization. **6**
 - b) The gray level histogram of an image is given below : **7**

Gray level	0	1	2	3	4	5	6	7
Frequency of Occurrence	400	700	1350	2500	3000	1500	550	0

Compute the Gray Level Histogram of the output image obtained by enhancing the input by Histogram equalization technique.

OR

4. a) Write a short note on RGB colour model. **6**
 - b) Write and explain the full colour processing. **7**
5. a) Obtain the 4 - length DCT for the following discrete sequence. **5**
 $\{1, 3, -2, 4\}$
 - b) For 2×2 transform A and the image U , calculate the transformed image V and the basis images : **8**

$$A = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}; \quad U = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

OR

6. a) Generate 4×4 Haar transform matrix. Apply Haar transform to the image shown. **8**
- | | | | |
|---|---|---|---|
| 1 | 2 | 4 | 5 |
| 2 | 3 | 6 | 7 |
| 3 | 6 | 3 | 2 |
| 1 | 4 | 6 | 7 |

- b) Generate 8×8 Hadamard Transform matrix. **5**

7. a) Explain the generalized image compression model with neat block diagram. **7**
- b) Determine which bit, if any is in error in the Hamming encoded messages : **7**
 $1\ 1\ 0\ 0\ 1\ 1\ 1$, $1\ 1\ 0\ 0\ 1\ 1\ 0$ and $1\ 1\ 0\ 0\ 0\ 1\ 0$. What are the decoded values?

OR

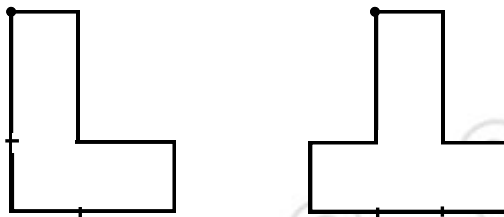
8. a) Write short notes on lossless predictive coding model. **7**
- b) The arithmetic decoding procedure is the reverse of the encoding procedure. Decode the message 0.23355, given the coding model. **7**

Symbol	a	e	i	o	u	!
Probability	0.2	0.3	0.1	0.2	0.1	0.1

9. a) Explain Gradient – and Laplacian operators. **7**
- b) Use a Hough transform to find a straight line. Given data points at (0, 1), (1, 1), (2, 2) and (3, 3). **6**

OR

10. a) Find the chain codes and shape numbers of the image given in fig. below. Also find the order of shape numbers. Assume 4-connectivity. **7**



- b) Find out the signature of each of the following : **6**
- i) Circle
 - ii) Square
 - iii) Equilateral triangle.

11. a) Write short notes on image degradation model. **6**
- b) List and explain common PDFs found in image processing applications. **7**

OR

12. a) Write a short note on Inverse Filtering. **6**
- b) With neat diagram explain the model of restoration process. **7**
