(2 ½ Hours) **[Total Marks: 75]**

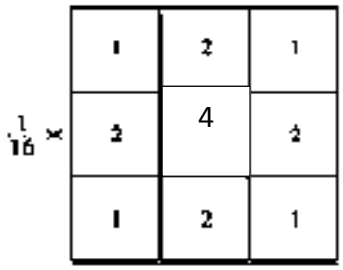
N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt All (Each of 5Marks) **(15M)**

(a) Multiple Choice Questions:

1 The transition between continuous values of the image function and its digital equivalent is called _____
a) Quantisation
b) Sampling
c) Rasterisation
d) None of the Mentioned

2 The mask shown in the figure below belongs to which type of filter?



a) Sharpening spatial filter
b) Median filter
c) Sharpening frequency filter
d) Smoothing spatial filter

3 Hit-or-miss transformation is used for shape_____.
a) Removal
b) Detection
c) Extraction
d) Hiding

4 Encoder is used for_____
a) image enhancement
b) image compression
c) image decompression
d) image equalization

5 Which of the following color model is used for color printing?
a) RGB
b) CMY
c) CMYK
d) CMY and CMYK

(b) **Fill in the blanks: (**s=clog10(1*r),Brightness, Dynamic range, Robert, opening, s=clog10(1+r), band range, Contrast, closing, sobel, canny)

1 The range of values spanned by the gray scale is called_____range.

2 Erosion followed by dilation is called_____.

3 A gradient operator for edge detection is _____.

4 The difference in intensity between the highest and the lowest intensity levels in an image is _____.

5 _____is the general form of representation of log transformation.

(c) **Short Answers:**

1 What is the name of process used to correct the power-law response phenomena?

2 The transformation s = T(r) producing a gray level s for each pixel value r of input image. Then, if the T(r) is satisfying $0 \leq T(r) \leq 1$ in interval $0 \leq r \leq 1$, what does it signifies?

3 What do you mean by the term pixel depth?

4 State True or False- Lossy Compression achieves greater compression.

5 What do you mean image segmentation?

Q. 2 **Attempt the following (Any THREE)(Each of 5Marks)** **(15M)**

(a) Write a short note on Sampling and Quantization.

(b) The input matrix x(m,n) and h(m,n). Perform the linear convolution between these two matrices.
x(m,n)={1,2,3; 4,5,6; 7,8,9} h(m,n)={1,1; 1,1; 1,1}

(c) Differentiate between monochrome and grayscale image.

(d) Discuss Haar Transform.

(e) Give any five applications of image processing system.

(f) Write a short note on KL transform.

Q. 3 **Attempt the following (Any THREE) (Each of 5Marks)** **(15M)**

(a) What is Structuring Element? Discuss its usage in morphological operation?

(b) Write a short note on Gray Level slicing.

(c) Explain various techniques of image arithmetic.

(d) Discuss opening and closing morphological operation.

(e) Perform Histogram Equalization on Gray level distribution shown in the table.

Gray levels	0	1	2	3	4	5	6	7
No. of Pixels	0	0	0	6	14	5	0	0

(f) List and explain two types of classification of Color-Quantisation Techniques.

Q. 4 Attempt the following (Any THREE) (Each of 5Marks) (15)

(a) Obtain the Huffman code for the word 'COMMITTEE'.
(b) Write a short note on Laplacian of Gaussian (LOG).
(c) Discuss how Arithmetic coding is used in image compression?
(d) Compare and contrast between inter pixel redundancy and coding redundancy.
(e) How is thresholding used in image segmentation?
(f) Explain- Region Splitting and Merging.

Q. 5 Attempt the following (Any THREE) (Each of 5Marks) (15)

(a) Explain 2D Line Impulse signal in detail.
(b) List and Explain limitations of the RGB Color Model.
(c) Compare lossy and lossless image compression.
(d) Explain Euclidean distance, City block distance, chess board distance.
(e) Write a short note on Slant Transform.
