

(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?

$\begin{matrix} 1 \\ 16 \end{matrix} \times$

|   |   |   |
|---|---|---|
| 1 | 2 | 1 |
| 2 | 4 | 2 |
| 1 | 2 | 1 |

- 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:** ( $s = \log_{10}(1+r)$ , Brightness, Dynamic range, Robert, opening,  $s = \log_{10}(1+r)$ , band range, Contrast, closing, sobel, canny)
- The range of values spanned by the gray scale is called \_\_\_\_\_ range.
  - Erosion followed by dilation is called \_\_\_\_\_.
  - A gradient operator for edge detection is \_\_\_\_\_.
  - The difference in intensity between the highest and the lowest intensity levels in an image is \_\_\_\_\_.
  - \_\_\_\_\_ is the general form of representation of log transformation.

(c) **Short Answers:**

- What is the name of process used to correct the power-law response phenomena?
- 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?
- What do you mean by the term pixel depth?
- State True or False- Lossy Compression achieves greater compression.
- What do you mean image segmentation?

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

- Write a short note on Sampling and Quantization.
- The input matrix  $x(m,n)$  and  $h(m,n)$ . Perform the linear convolution between these two matrices.  
 $x(m,n) = \{1, 2, 3; 4, 5, 6; 7, 8, 9\}$   $h(m,n) = \{1, 1; 1, 1; 1, 1\}$
- Differentiate between monochrome and grayscale image.
- Discuss Haar Transform.
- Give any five applications of image processing system.
- Write a short note on KL transform.

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

- What is Structuring Element? Discuss its usage in morphological operation?
- Write a short note on Gray Level slicing.
- Explain various techniques of image arithmetic.
- Discuss opening and closing morphological operation.
- 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 |

- 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.
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