
Image Processing

Time: 3 hrs.  Max. Marks: 100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART - A

1. a. With the help of a neat block diagram, explain the components of a general purpose image processing system. (10 Marks)
   b. Explain the importance of brightness adaptation and discrimination in image processing. (06 Marks)
   c. Mention the applications of image processing. (04 Marks)

2. a. How many minutes would it take to transmit a 512 x 512 image with 256 grey levels at 300 baud rate? (Baud rate is the number of bits transmitted per second. Assume each byte is one packet with a start bit and stop bit). (04 Marks)
   b. Explain the process of image acquisition by sensor strips and sensor arrays. (10 Marks)
   c. Consider the image segment given in Fig.Q2(c). Let V = {2, 3, 4}, compute the lengths of the shortest 4, 8 and m path between 'P' and 'Q'. If path does not exist, explain why.

   \[
   0 \ 1 \ 0 \ 4 \ 2 \ (n) \\
   2 \ 2 \ 3 \ 4 \\
   \]

   \[
   (p) 3 \ 0 \ 4 \ 2 \ 1 \\
   1 \ 2 \ 0 \ 3 \ 4 \\
   \]

   Fig.Q2(c) (06 Marks)

3. a. Explain any four properties of two dimensional Fourier transforms. (08 Marks)
   b. What are basis vectors? (04 Marks)
   c. For the given orthogonal matrix \( A = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \) and image \( u = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \), obtain the transformed image and basis images. (08 Marks)

4. a. Define discrete sine transfer and its inverse transformation. Discuss any three properties of discrete sine transformation. (10 Marks)
   b. Develop Haar transform for \( n = 2 \). Discuss the properties of Haar transform. (10 Marks)

PART - B

5. a. Explain the following with applications:
   i) Contrast stretching
   ii) Bit plane slicing
   iii) Grey level slicing
   iv) AND operation (10 Marks)
b. For the given $4 \times 4$ image having grey scales between [0, 9], perform histogram equalization and draw the histogram of image before and after equalization.

\[
\begin{bmatrix}
2 & 3 & 3 & 2 \\
4 & 2 & 4 & 3 \\
3 & 2 & 3 & 5 \\
2 & 4 & 2 & 4
\end{bmatrix}
\]

(10 Marks)

6 a. Explain the basic concept of spatial filtering in image enhancement and hence explain importance of smoothing filters and median filters.

b. Explain homomorphic filters in image enhancement with neat block diagram.

(10 Marks)

7 a. Define the process of image restoration. Explain any four important noise probability density functions.

b. Explain Weiner filtering and inverse filtering in image processing.

(10 Marks)

8 a. Explain HSI color model and conversion from HSI to RGB colors.

b. What is pseudo color image processing? Explain grey level to color transformations.

(10 Marks)