

Seventh Semester B.E. Degree Examination, June 2012
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 a neat block diagram, describe various components used in general purpose image processing system. (10 Marks)
 - b. Describe briefly the principle of image formation in human eye. (05 Marks)
 - c. “Perceived brightness is not a simple function of intensity”. Why? (05 Marks)
 - 2 a. What is image sampling and quantization? What are the different parameters which will decide the number of storage bits of the image in discrete domain? (10 Marks)
 - b. Find D_8 and D_m for the following 2-D section with $V = \{0, 1\}$ and $V = \{1, 2\}$ between p and q. (05 Marks)
- | | | | | | |
|-----|---|---|---|---|-----|
| 5 | 4 | 3 | 1 | 1 | (q) |
| 5 | 4 | 0 | 2 | 0 | |
| 3 | 2 | 0 | 2 | 4 | |
| 2 | 1 | 1 | 3 | 5 | |
| (p) | 1 | 3 | 5 | 1 | 3 |
- c. Explain the process of image acquisition using single sensor. (05 Marks)
 - 3 a. Explain any four properties of two dimensional Fourier transform. (08 Marks)
 - b. Prove that if an image $f(m, n)$; $0 \leq m \leq M - 1$ and $0 \leq n \leq N - 1$, is multiplied by the checkerboard pattern $(-1)^{m+n}$, then its DFT is centred at $(M/2, N/2)$. (06 Marks)
 - c. Write four properties of Hadamard transform. (06 Marks)
 - 4 a. Compute discrete cosine transform matrix for $N = 4$. (10 Marks)
 - b. Compute the basis of the KL transform for the input data $x_1 = (4, 4, 5)^T$, $x_2 = (3, 2, 5)^T$, $x_3 = (5, 7, 6)^T$ and $x_4 = (6, 7, 7)^T$. (10 Marks)

PART – B

- 5 a. Perform histogram equalization for the following image data, Fig.Q.5(a). Sketch the histogram of the original image and histogram of equalized image. (10 Marks)

| | | | | | | | | |
|-------|-----|------|-----|-----|-----|-----|-----|----|
| r_k | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| n_k | 790 | 1023 | 850 | 656 | 329 | 245 | 122 | 81 |

Fig.Q.5(a)

- b. What is the importance of image enhancement in image processing? Explain in brief any two point processing techniques implemented in image processing. (10 Marks)
 - 6 a. What is homomorphic filtering? Explain the filtering approach with a block diagram. Indicate where this filter is used and the effect of using these filters images. (10 Marks)
 - b. Write short notes on Weiner filtering and inverse filtering. (10 Marks)
 - 7 a. Discuss various mean filters and order statistics filters in image restoration system. (10 Marks)
 - b. Justify the statements “median filter is an effective tool to minimize salt and pepper noise” using the following image segment below : (10 Marks)
- | | | | | | |
|----|-----|----|----|----|----|
| 24 | 22 | 33 | 25 | 32 | 24 |
| 34 | 255 | 24 | 0 | 26 | 23 |
| 23 | 21 | 32 | 31 | 28 | 26 |
- 8 a. Explain the pseudo color image processing with neat functional block diagram. (10 Marks)
 - b. Discuss briefly the HSI color model and RGB color model used in color image processing. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.