P1355

[3764]-257

B.E. (Electronics)
DIGITAL IMAGE PROCESSING
(2003 Course) (404212)

Time : 3 Hours]　　　　　　　　　　　　　　　　　[Max. Marks : 100

Instructions to the candidates :

1) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q. 10 and Q. 11 or Q. 12.

2) Answers to the two sections should be written separately.

3) Neat diagrams must be drawn wherever necessary.

4) Figures to the right indicate full marks.

5) Assume suitable data, if necessary.

6) Use of electronic pocket calculator is allowed.

SECTION - I

Q1) a) Explain any one technique for image acquisition in detail. 　　[8]

　　　b) Write the various ways of finding distance between two pixels. State the significance of distance finding. 　　[8]

OR

Q2) a) What is Moire' pattern effect? Why does it occur? Suggest techniques to remove this effect from an image. 　　[8]

　　　b) Consider the image segment shown.

```
3  1  2  1(q)
2  2  0  2
1  2  1  1
(p)1  0  1  1
```

Let $V = \{0, 1\}$ and compute the lengths of the shortest 4, 8 and m paths between 'p' & 'q'. If a particular path does not exist between these 2 pixels, explain why? 　　[8]

Q3) a) Compute the 2D DFT of the 4 × 4 grayscale image given below :[10]

$$f(m, n) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

b) What is colour space? Mention various types of colour spaces with their specific applications. [6]

OR

Q4) a) Explain Hadamard Transform. Derive Hadamard matrix for N = 4.[8]

b) Explain HSI colour model in detail. [8]

Q5) a) Perform histogram equalization of the image

$$I = \begin{bmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{bmatrix}$$

containing graylevels from 0 to 7. Also draw the histograms before and after equalization. [10]

b) Write a note on : [8]

i) Contrast stretching.

ii) Unsharp masking.

OR

Q6) a) Justify the statement 'Median filter is an effective tool to minimize salt & pepper noise' considering the image

$$I = \begin{bmatrix} 24 & 22 & 33 & 25 & 22 & 24 \\ 34 & 255 & 24 & 0 & 26 & 23 \\ 23 & 21 & 32 & 31 & 28 & 26 \end{bmatrix}$$ [10]

b) What is meant by pseudo coloring? Explain its application. Explain how a pseudo coloured image can be obtained? [8]

SECTION - II

Q7) a) What is RLC? Which type of redundancy is exploited by RLC? Derive RLC codes considering an 8 × 8 binary image. [8]

b) Calculate the efficiency of Huffman code for the following symbol whose probability of occurrence is given below : [8]

Symbol	Probability
a_1	0.9
a_2	0.06
a_3	0.02
a_4	0.02

OR

Q8) a) Explain the Huffman coding for image compression considering an example. [8]

b) What is redundancy? How redundancy can be an effective tool for image compression? Explain any one redundancy and suggest a compression technique to get rid of it. [8]

Q9) a) A binary image X and the structuring element B are given as follows :

```
0 0 0 0 0 0
0 1 1 1 0 0
0 1 1 1 0 0
0 0 1 1 1 0          0 1 0
0 0 1 1 1 0          1 1 1
0 0 0 0 0 0          0 1 0
       X               B
```

Perform : $y_1 = X \ominus B$ and $y_2 = X \oplus B$. [10]

b) Explain the algorithm for adaptive thresholding. [6]

OR

Q10) a) Derive the kernel for second order derivative for detecting edges. Compare its performance with first order derivative. **[8]**

b) Write the algorithm for finding chain codes in 4 direction & 8 direction. **[8]**

Q11) a) Explain various noise models occurring in an image. **[8]**

b) Explain with the help of block diagram, the steps required for finger print recognition system. Suggest the algorithms for each block. **[10]**

OR

Q12) a) Explain Weiner filtering. **[8]**

b) Explain with the help of block diagram, the steps required for remote sensing application of Image processing. Also suggest the algorithms for each block. **[10]**

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