Total No. of Questions : 12]

SEAT No. :

P1865

[Total No. of Pages : 3

[5059]-174

B.E. (Electronics & Telecommunication)

DIGITAL IMAGE PROCESSING

(2008 Pattern) (Elective - I)

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 from Section I and Q.7 or Q.8, Q.9 or Q.1O, Q.11 or Q.12 from Section II.*
2) *Answers to the two sections should be written in separate answer books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) With reference to relation between pixels explain **[8]**

     i) 4 connectivity

     ii) 8 connectivity

     b) Draw a neat block diagram of basic digital image processing system using fundamental components. Explain in detail. **[8]**

OR

Q2) a) Write a short note on human visual system. **[8]**

     b) What is necessity of image digitization. Discuss uniform and non uniform sampling process. **[8]**

Q3) a) Explain the following concept with respect to zooming - **[8]**

     i) Replication

     ii) Interpolation

     b) Show that a high pass filtered image can be obtained in the spatial domain as "High Pass filtered image = original image - Low Pass filtered image".**[8]**

OR

P.T.O.

Q4) a) What is meant by histogram. Explain the steps in histogram equalisation. **[8]**

b) What is colour model? Explain HSI to RGB conversion. **[8]**

Q5) a) Write formulae for 2D DFT - forward and inverse transform. Explain properties of 2D - DFT and state its applications. **[9]**

b) With reference to 2D transform, explain. **[9]**

   i) Symmetry

   ii) Basis images

   iii) Rotation

OR

Q6) a) Find 2D - DCT of following image matrix. **[9]**

$$\begin{bmatrix} 4 & 2 \\ 4 & 2 \end{bmatrix}$$

Write one application of DCT.

b) Write short note on KL transform Differentiate between DFT and DCT.**[9]**

SECTION - II

Q7) a) In transform based image compression image is subdivided into smaller subimages. Discuss the effect of subimage size on **[8]**

   i) Compression performance

   ii) Computational complexity

b) What is data redundancy? Explain various data redundancies identified in an image. **[8]**

OR

Q8) a) Explain with neat block diagram working of two dimensional transform coding for image compression. Discuss considerations for selection of size of subimage. **[8]**

b) An image consists of 8 gray levels 90 to 97 with probabilities 0.3, 0.3, 0.1, 0.08, 0.08, 0.07, 0.05, 0.02. Give Huffman code for gray levels and comment on coding efficiency. **[8]**

Q9) a) Derive the kernel for second order derivative for defecting edges. Compare its performance with first order derivative. **[8]**

b) Explain the following transformations stating their applications. **[8]**

    i) Erosion

    ii) Dilation

    iii) Opening

    iv) Closing

OR

Q10) a) Explain chain code and B splines for boundary representation. **[8]**

b) Explain Laplacian edge detector. Why is LoG operator preferred over Laplacian for edge detection. Explain in detail. **[8]**

Q11) a) In relation to restoration filters, explain the mathematics and significance of arithmetic mean, geometric mean, harmonic and contra harmonic mean filters. **[8]**

b) With relevant block diagram, explain in detail character Recognition system stating its applications. **[10]**

OR

Q12) a) Explain with proper mathematics, various noise models with their PDF, occuring in an image (any 4). **[8]**

b) Explain in detail fingerprint recognition system in Image Processing. **[10]**

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