CS/B.Tech (BME)/SEM-8/BME-801/2010

2010
MEDICAL IMAGE PROCESSING

Time Allotted : 3 Hours   *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

    i)   Unit of image is called

         a)   Mal   b)   Pal

         c)   Point   d)   None of these.

    ii)   JPEG is

         a)   Joint Photographic Enhancement Group

         b)   Joint Photographic Experts Group

         c)   Joint Photographic Experts Graphic

         d)   None of these.

    iii)   The power-law response phenomena is called

         a)   hue correction   b)   gamma correction

         c)   sharpness correction   d)   edge correction.

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iv) Smoothing filter is a/an

   a) LPF   b) HPF

   c) BPF   d) All pass filter.

v) A gray-scale image is also known as

   a) indexed image   b) binary image

   c) black & white image   d) intensity image.

vi) The D8 is also known as

   a) Euclidean distance   b) 8-distance

   c) Chessboard distance   d) None of these.

vii) Delta modulation is a

   a) lossy coding   b) lossless coding

   c) predictive coding   d) none of these.

viii) To remove salt-and-pepper noise we use

   a) Arithmetic mean filter

   b) Harmonic mean filter

   c) Contra-Harmonic mean filter

   d) Order statistics filter.

ix) Which mask has the superior noise-suppression characteristics ?

   a) Roberts   b) Prewitt

   c) Sobel   d) None of these.

x) The optimal predictor used in predictive coding applications of Lossy compression

   a) minimizes the encoder's mean-square prediction error

   b) minimizes the decoder's mean-square prediction error

   c) does not effect the encoder's mean-square prediction error

   d) is not regulate the encoder's mean-square prediction error.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.   3 × 5 = 15

2. Which filter can be used for smoothing a sand blast image ? What are the various types of filters for performing the above operations ? Design a Gaussian lowpass filter.   1 + 1 + 3

3. Define lossless predictive coding of error free image compression with appropriate encoder and decoder model.   5

4. What are the steps of image digitalization ?   5

5. Define 'Resolution' of a digital image. Briefly explain 'Checkerboard pattern' and 'False contouring'.   1 + (2 + 2)

6. Express an image function $f (x, y)$ as an $M \times N$ matrix. What is 'Image restoration' ? Draw the model of the image degradation process.   2 + 1 + 2

7. Define the distance function ? What are Euclidean distance, City Block distance and Chessboard distance ?   2 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following.   3 × 15 = 45

8. What do you mean by a skeleton of an image ? Write a brief note on first order differential methods of edge detection. What is unsharp masking ?   4 + 8 + 3

9. What is the histogram equalization technique ? Explain the edge preserving smoothing. Explain the Image sharpening with a matrix.   5 + 5 + 5

10. a) How can you filter a noisy image to get back the original image in spatial domain ? 4

b) What do you mean by blurring of an image ? How smoothing filter can be used for blurring an image ?

1 + 5

c) Describe the Laplacian method for image enhancement. 5

11. a) Describe the Fidelity criteria. 5

b) What are the image compression models ? Describe the source encoder and decoder model with block diagram. 1 + 4

c) Draw the masks for point detection and line detection. 1 + 4

12. a) What do you mean by 'Fourier spectrum', 'Phase spectrum' and 'Fourier power spectrum' ? 3 + 3 + 2

b) Discuss about any *two* filters used as tools for periodic noise reduction in frequency domain. 7

13. Write short notes on any *three* of the following : 3 × 5

a) Hit-and-Miss operation

b) Dilation and Erosion

c) Image thickening and thinning

d) High boost filtering

e) HSI model.