Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH/BME/SEM-8/BME-801/2013

2013
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) Opening is
      a) Closing of Erosion
      b) Erosion of Dilation
      c) Dilation of Erosion
      d) Erosion of Subtraction.

   ii) Which of the following is not the remote sensing image ?
      a) MRI b) Thermal Image
      c) Infrared Image d) Visual Light Image.

   iii) ..... Operator calculates the gradient vector in diagonal direction.
      a) Prewitt b) Gaussian
      c) Sobel d) Robert's Cross.

   iv) 'Single' data class consists of
      a) 2 bytes per element b) 4 bytes per element
      c) 8 bytes per element d) 1 byte per element.

v) In Bit-Plane Slicing method, the higher order bits give
   a) Gross structure of the image
   b) Fine structure of the image
   c) Brightness of the image
   d) Contrast of the image.

vi) Gamma correction is related to
   a) Image negative
   b) Log transormation
   c) Power law transformation
   d) Piecewise linear transformation.

vii) Image smoothing is achieved by
   a) Ideal High Pass filter
   b) Gaussian Filter
   c) Average filter
   d) Bandpass filter.

viii) 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) does not regulate the encoder's mean-square prediction error.

ix) For a pixel p (x, y), which is not the co-ordinate of $N_D(p)$?
   a) $(x, y-1)$ b) $(x-1, y-1)$
   c) $(x+1, y-1)$ d) $(x-1, y+1)$.

x) To capture an image we lose ..... dimension.
   a) One b) Two
   c) Three d) Four.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. "Lossless Data Compression always makes files longer". Justify the statement.
3. How does a median filter work better than a mean filter in terms of image smoothing ?
4. How can one obtain an enhanced image with a specified histogram ?
5. Draw HSI Model with a neat sketch and define each term.
6. How will you restore a degraded image by using noise suppression technique ?
7. How 1D DFT can be used for reconstruction of MRI images ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. What are the characteristics of Image Operation ? Explain thoroughly. What is the difference between boundary representation and regional representation in image segmentation ? What is Block Circulant Matrix ? How does it play a crucial role in the process of homomorphic filtering ?

7+ 2 + 1 + 5

9. What is histogram equalization ? How do we get a uniform image distribution by this method ? Why is Sobel called more emphasized filter than Prewitt ? Write the properties of Fourier Transform. 2 + 5 + 3 + 5

10. What do you mean by the word "Image" ? What is the definition of digital image ? Draw the image degradation-restoration model neatly. What are the problems of gradient-based edge detectors ? What do you mean by the phrase "Erosion of Dilation" ? Explain it with proper equations.

2 + 2 + 3 + 4 + 4

11. What is restoration ? Why is it necessary in image processing ? What are the methods of Lossy Compression ? What is Hit-and-Miss Operator and how does it help to make the Skeleton of an Image ? How is a thinning algorithm based on Hit-and-Miss Operator ? 2 + 3 + 4 + 4 + 2

12. a) How are CT scan images being reconstructed by Back Projection method ?

    b) Explain briefly the Fan Beam Projection method for reconstruction of parallel beam projection images ?

    c) Implement Pattern recognition method to analyse the disease dengue. 5 + 5 + 5

13. a) How can you enhance a black iris of an eye of a beautiful lady to brown colour ? Give your explanation by a suitable algorithm.

    b) How boundaries of an image can be preserved while filtering the image ? Explain with a proper algorithm.

    c) Explain High Boost filtering. 7 + 5 + 3