



Name :
Roll No. :
Invigilator's Signature :

CS/B. TECH (BME)/SEM-8/BME-801/2012

2012

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) JPEG is
 - a) Joint Photographic Enhancement Group
 - b) Joint Photographic Experts Group
 - c) Joint Photographic Experts Graphic
 - d) None of these.
 - ii) 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) $(x-1, y+1)$.
 - iii) Complement of Green is
 - a) Red
 - b) Cyan
 - c) Magenta
 - d) Yellow.



- iv) Low contrast image has distribution of histogram.
 - a) lower end
 - b) higher end
 - c) narrow range
 - d) wider range.
- v) Variance of pixel values in a region of an image predictsof an image.
 - a) darkness
 - b) brightness
 - c) contrast
 - d) lines.
- vi) Unit 8 is
 - a) unsigned 8 bit integer 4 bytes per element
 - b) unsigned 16 bit integer 1 byte per element
 - c) unsigned 8 bit integer 1 byte per element
 - d) unsigned 16 bit integer 2 bytes per element.
- vii) The D_8 is also known as
 - a) Euclidean distance
 - b) 8-distance
 - c) chess-board distance
 - d) city block distance.
- viii) operator calculates the gradient vector in diagonal direction.
 - a) Prewitt
 - b) Gaussian
 - c) Sobel
 - d) Robert's Cross.
- ix) A gray-scale image is also known as
 - a) indexed image
 - b) binary image
 - c) black & white image
 - d) intensity image.
- x) Which mask has the superior noise-suppression characteristics ?
 - a) Roberts
 - b) Prewitt
 - c) Sobel
 - d) None of these.



GROUP – B

(Short Answer Type Questions)

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

2. Define 'Resolution' of a digital image. Briefly explain 'Checker board pattern' and 'False contouring'. $1 + (2 + 2)$
3. How can you prevent an image from getting blurred at high frequency region while smoothening of that image ?
4. 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. $2 + 1 + 2$
5. Given the PDF values for the following six features in an image to be transferred by Huffman Coding :
 $a_1 = 0.1, a_2 = 0.4, a_3 = 0.06, a_4 = 0.1, a_5 = 0.04$ and rest is a_6 .
Obtain the value of Average Length of the code, Entropy of the source and Huffman efficiency for this data set coding.
6. Draw HSI and CMY Colour Model with a neat sketch and define each term.
7. Define the distance function. What is Euclidean distance, City Block distance and Chessboard distance ? $2 + 3$

GROUP – C

(Long Answer Type Questions)

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

8. a) What do you mean by 'Fourier spectrum', 'Phase spectrum' and 'Fourier power spectrum'? Write down the related mathematical expressions.
b) What do you mean by a 'digital image' ?
c) Draw a neat block diagram showing the different steps followed in digital image processing. $(3 + 3 + 2) + 3 + 4$



9. a) How can you obtain an enhanced image of a predefined histogram curve from an input image ?
b) How can you adjust the brightness of an image on a CRT ?
c) Explain each stage of image compression model systematically with proper schematic. $4 + 3 + 8$
10. a) Write an algorithm to enhance the black colour of iris of eyes to brown colour in an image of the face of a beautiful lady.
b) Write an algorithm to reduce the ring effect at the boundary of an image while enhancing the image.
c) What type of mask is used for the stronger response to finer details in an image ? Explain that mask briefly. $5 + 5 + (1 + 4)$
11. What is the histogram equalization technique ? Explain the edge preserving smoothing. Explain the image sharpening with a matrix. $5 + 5 + 5$
12. How can you perform edge linking globally in a corrupted image ? Name the method and describe it with proper mathematical solution. What are the merits and demerits of lossless compression over lossy compression ? $10 + 5$
13. a) Define 4-connectivity, 8-connectivity and m -connectivity.
b) Briefly explain the ways of measuring distance between two pixels.
c) What is Unsharp Masking ? $(2 + 2 + 2) + 6 + 3$
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