MEDICAL IMAGE PROCESSING (SEMESTER - 8)

CS/B.TECH(BME)/SEM-8/BME-801/09

1. ..... *Signature of Invigilator*

2. ..... *Signature of the Officer-in-Charge*

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.TECH(BME)/SEM-8/BME-801/09

ENGINEERING & MANAGEMENT EXAMINATIONS, APRIL – 2009

MEDICAL IMAGE PROCESSING (SEMESTER - 8)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

	Group – A										Group – B			Group – C			***Total Marks***	***Examiner's Signature***
Question Number																		
Marks Obtained																		

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Head-Examiner/Co-Ordinator/Scrutineer

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ENGINEERING & MANAGEMENT EXAMINATIONS, APRIL – 2009

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct answer for the following : 10 × 1 = 10

i) 'Laplacian' is a

a) First Order Smoothing Filter

b) Second Order Smoothing Filter

c) First Order Sharpening Filter

d) Second Order Sharpening Filter. ☐

ii) If we use a filter whose characteristics is H (u, v) = 0,

for (u, v) = (M/2, N/2) = 1, otherwise.

Then it is a

a) Low-pass Filter b) High-pass Filter

c) Notch Filter d) Butterworth Filter. ☐

iii) In a piecewise linear model of a contrast stretching function, if $r_1 = s_1$ and $r_2 = s_2$, then the function becomes

a) Thresholding function b) Linear function

c) Image Enhancement function d) Logarithmic function. ☐

iv) Using Power Law Transformation Technique if an image biased in the dark zone has to be converted into a higher contrast image, we have to use

a) gamma > 1 b) gamma = 1

c) gamma < 1 d) gamma = 0. ☐

v) In on Order Statistics Filter the most commonly used filter is

a) Min filter b) Max filter

c) Median filter d) Mode filter. ☐

vi) Digitizing the coordinate values of an image is

a) Quantization b) Sampling

c) Restoration d) Equating. ☐

vii) If R is the subset of the pixels in an image, then R is called at region of the image if R is a

a) component of a set S b) connected set

c) disconnected set d) none of these. ☐

viii) Unsharp masking may be expressed as

a) $f_s\ (x, y) = f(x, y) - f^-(x, y)$

b) $f_s\ (x, y) = f(x, y) + f_1(x, y)$

c) $f_s\ (x, y) = f^-(x, y) - f(x, y)$

d) none of these. ☐

ix) Butterworth filter of the order 20 exhibits the characteristics of

a) ILPF b) GLPF

c) BPLF d) None of these. ☐

x) Gaussian Filter function is given by the equation

a) $H(u) = Ae^{-u^2/2\sigma^2}$ b) $H(u) = Be^{-u^2/2\sigma^2}$

c) $H(u) = Ae^{u^2/2\sigma^2}$ d) none of these. ☐

GROUP – B
(Short Answer Type Questions)

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

2. With a neat block diagram state the various steps involved in Digital Image Processing.
3. How are zooming and shrinking of images achieved ? Explain the methods with special emphasis on different interpolation techniques.
4. Explain in brief the different types of Order Statistics Filter and their use in noise removal.
5. Describe the sampling and quantization process to create a digital image.
6. Why is back propagation learning also called generalized delta rule ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* questions. 3 × 15 = 45

7. a) What is image restoration ? Give two areas where restoration process can be applied.

   b) With a neat block diagram, explain the image degradation model. 5 + 10 = 15

8. a) Explain the various aspects of fidelity criteria in detail.

   b) Distinguish between lossy and lossless compression in image processing.

   c) What is vector quantization ? Explain briefly. 7 + 4 + 4 = 15

9. a) What are 'bit-planes' ? Explain how the different bit-planes contribute to the overall appearance of an image.

   b) What do you mean by 'Histogram' of an image ? Describe 'Histogram Matching' Technique. 7 + 8 = 15

10. a) Write the basic steps of filtering in the frequency domain. Explain in brief the characteristics of an Ideal LPF.

    b) What is the foundation of designing Sharpening Spatial Filters ? Explain the advantages and disadvantages of first-order and second-order filters. 7 + 8 = 15

11. Write down the working principle of median filter. Which one is better–median or average filter and why ? Discuss about Prewitt and Sobel operator for detecting edge present in an image. Give a brief overview of Laplacian operator.

    3 + 2 + 3 + 3 + 4 = 15

12. What is the principal objective of image enhancement ? What do you mean by Histogram of a digital image ? What is its application ? Define dark, light, low contrast and high contrast image with respect to their histogram analysis. Write down the necessary conditions of the transformation function used in Histogram Equalization technique. What does it guarantee ? 2 + 3 + 2 + 4 + 4 = 15

END