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Invigilator's Signature :

CS/B.TECH(BME)/SEM-8/BME-801/2011 2011

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 :

 $10 \times 1 = 10$

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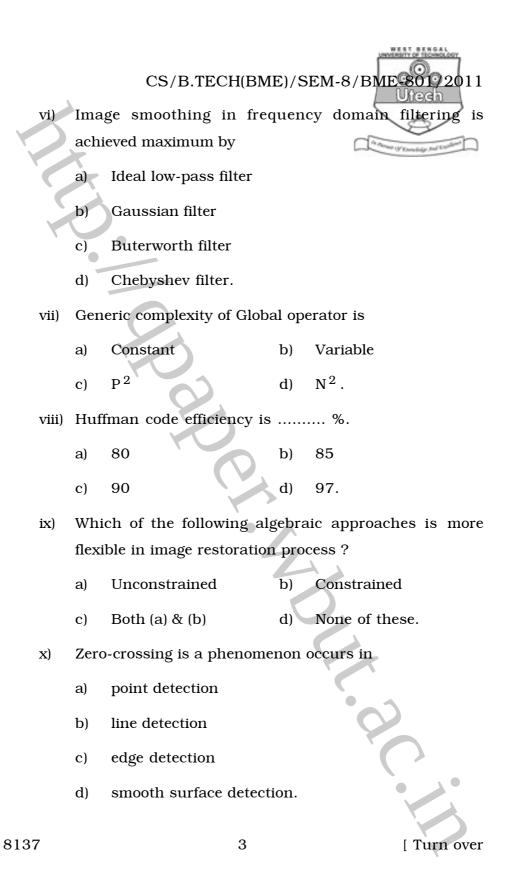
- i) If *I* stands for unit matrix, then the matrix *U* is said to be 'unitary' if
 - a) $U^{T^*} U = U^{-1}$
 - b) $UU^{T^*} = U^{-1}$
 - c) $UU^{T^*} = I$
 - d) $U^{T^*} U = I.$

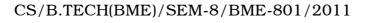
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- ii) In Bit-plane slicing method, the higher order bi
 - a) Gross structure of the image
 - b) Fine structure of the image
 - c) Brightness of the image
 - d) Contrast of the image.
- iii) An impulse noise is considered as
 - a) Multiplicative noise b) Erlang noise
 - c) Normal noise d) Additive noise.
- iv) High contrast image has distribution of histogram.
 - a) lower end b) gigher end
 - c) narrow range d) wider range.
- v) FBP stands for
 - a) False blurred point
 - b) Finite blurred position
 - c) Fan beam projection
 - d) Fourier beam projection.





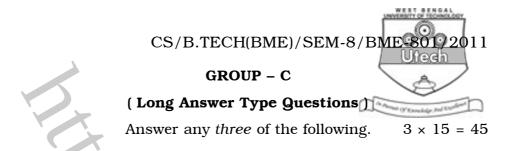
GROUP – **B**

(**Short Answer Type Questions**) Answer any *three* of the following.

 $3 \times 5 = 15$

2. What are Adjacency, Connectivity and Path ? $2 + 1\frac{1}{2} + 1\frac{1}{2}$

- 3. a) You are given an image which is represented by a matrix G: Prove that GG^T is symmetric.
 - b) How can you write the diserete Fourier transform in matrix form ? 2 + 3
- 4. Draw HSI Model with a neat sketch and define each term. 5
- 5. What is Image Restoration ? 5
- 6. What do you mean by zero-crossing ? How can you obtain a line from an edge ?1 + 4
- 7. a) Write two basic prerequisites to implement algebraic reconstruction techniques applied in the process of image reconstruction from projection.
 - b) What is the meaning of the point spread function ? 2 + 3



8. a) Describe the technique of Histogram matching.

- b) How can you adjust the brightness of an image on a CRT ?
- c) How does an ideal low-pass filter work for image smoothing in frequency domain ? What are the methodologies of using Butterworth filter for the same ? 5 + 4 + (3 + 3)
- 9. a) Confirm the realationship between the average of the image *g* and its DFT, where *g* is given by

b) Why do we need the statistical description of images ?

c) What is an intensity image ? What do you mean by City block distance and Chessboard distance ?

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10. a) How can you enhance the dark region of an image,keeping the bright region unchanged of a gray scale image ?

- b) How can you keep the information of edges of an image while filtering with a mask ? Give a probable algorithm to support your answer.
- c) What do you mean by Hamming code ? 5 + 5 + 5
- 11. a) What is the basic difference between image enhancement and image restroration ? How do we define a 2D filter ?
 - b) How can we obtain information on the transfer function
 H (u, v) of the image degradation process ? What happens to the point (u, v) when H (u, v) = 0 ?
 - c) Draw the model of the image degradation / restoration process. Give an example of circulant matrix.

(2+2)+(4+3)+(3+1)

- 12. a) What do you mean by fidelity criteria ? Obtain an expression for mean square SNR in case of objective fidelity criteria.
 - b) What is Huffman coding ? Explain in detail the method of Huffman coding considering six character symbol.

(3+4)+(2+6)

- CS/B.TECH(BME)/SEM-8/BME-801/2011 13. a) What exactly is the purpose of image segmentation and edge detection ? Are there any segmentation methods that taken into consideration for the spatial proximity of pixels ?
 - b) Briefly explain the ways of measuring distance between two pixels.
 - c) Name two well known image degradation phenomena. Express an image function f(x, y) as an M × N matrix form. (3 + 3) + 6 + (1 + 2)

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