Code No: NR421203 **Set No.1**

IV B.Tech. II Semester Regular Examinations, April/May -2005
DIGITAL SPEECH & IMAGE PROCESSING
(Information Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the concept of image sampling in detail.
   (b) What is aliasing? How it can be avoided?
2. (a) Derive the transformation function applicable for histogram equalization.
   (b) What are the advantages of histogram equalization.
3. (a) Explain smoothing using rotating mask and the algorithm for this type of smoothing.
   (b) Explain what is spatial filtering
4. The speed of a bullet in flight is to be estimated by using high-speed imaging techniques. The method of choice involves the use of a TV camera and flash that exposes the scene for K sec. The bullet is 2.5cm long, 2 cm wide, and its range of speed is 750± 250 m/s. The camera optics produce an image in which the bullet occupies 10% of the horizontal resolution of a 256 X 256 digital image.
   (a)) Determine the maximum value of K that will guarantee that the blur from motion does not exceed 1 pixel.
   (b) Propose a segmentation procedure for automatically extracting the bullet from a sequence of frames.
5. (a) How the second derivative is computed using gray-values of an image.
   (b) What are the Sobel's operations for a 3× 3 region of an image.
6. (a) Discuss the differences between thinning and skeletonization. Explain the skeletonization with an example.
   (b) What is pruning? Explain with a neat diagram.
7. (a) What do you mean by relative address coding?
   (b) Differentiate one dimentional and two dimentional Run length coding.
   (c) What are the advantages of white block skipping?
8. How statistical coding is differentiated from spatial coding? Give one example for both the coding. Explain.

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Code No: NR421203 **Set No.2**

IV B.Tech. II Semester Regular Examinations, April/May -2005
DIGITAL SPEECH & IMAGE PROCESSING
(Information Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) With a brief note on image scanning technique, explain a typical image scanning system in detail.
   (b) Write a brief note on interlaced scanning.
2. Give a detailed note about different point processing techniques.
3. What is convolution function? How is the same implemented using a scan line Algorithm?
4. Explain various detection of discontinuity methods in detail with suitable examples.
5. Distinguish first-order derivative and second -order derivative of a 2-D function. Give the example operators for each of the derivatives.
6. (a) Explain with an example the boundary extraction using morphology operations.
   (b) Write short notes on opening and closing
7. (a) Consider an 8-pixel line of gray scale data $\{12, 12, 13, 13, 10, 13, 57, 54\}$ Which has been uniformly quantized with 6 bit accuracy.Construct it as 3 bit IGS code?
   (b) Compare the drawbacks and advantages of lossy and lossless compression
8. (a) Explain about
      i. slope overload
      ii. granular noise.
   (b) List out the advandages and drawbacks of different types of lossy compression techniques.

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Code No: NR421203 **Set No.3**

IV B.Tech. II Semester Regular Examinations, April/May -2005
DIGITAL SPEECH & IMAGE PROCESSING
(Information Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain different colour models and their relevance to image processing in detail.
2. (a) Explain the following gray level transformations :
   i. Image negatives
   ii. Log tansformations
   iii. Power law transformations.
   (b) Explain the need for histogram equalization.
3. Find the averaging and median filtering outputs for the given input image. Assume each mask is of size 3x3. Assume two rows and columns of zeroes are added on all sides of the images. The 4x4 input image gray values are given below.

$$\begin{bmatrix} 1 & 4 & 3 & 0 \\ 2 & 5 & 5 & 4 \\ 1 & 2 & 0 & 3 \\ 3 & 2 & 6 & 4 \end{bmatrix}$$

4. Explain various detection of discontinuity methods in detail with suitable examples.
5. A sample image of size 5× 5 is shown below:

$$\begin{bmatrix} 3 & 2 & 3 & 4 & 1 \\ 0 & 2 & 4 & 3 & 7 \\ 3 & 4 & 2 & 1 & 0 \\ 4 & 1 & 3 & 3 & 7 \\ 5 & 4 & 5 & 4 & 6 \end{bmatrix}$$

   Apply the mask corresponds to the Laplacean function of the form and show the truncated output image of size 3× 3.

$$\nabla^2 f = 4Z_5 - (Z_2 + Z_4 + Z_6 + Z_8)\,.$$

6. (a) With examples, explain how morphology operations are used in region filling
   (b) Discuss the various applications for gray scale morphology
7. (a) With a neat block diagram, describe the image compression system model
   (b) What do you mean by mapper in source encoder?

(c) Compare the statistical Compression and spatial Compression.

8. (a) Explain about
   i. slope overload
   ii. granular noise.

   (b) List out the advandages and drawbacks of different types of lossy compression techniques.

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Code No: NR421203 **Set No.4**

IV B.Tech. II Semester Regular Examinations, April/May -2005
DIGITAL SPEECH & IMAGE PROCESSING
(Information Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain how a RGB colour image is converted into different colour models using different conversion formula.

2. (a) Explain the following gray level transformations :
   i. Image negatives
   ii. Log tansformations
   iii. Power law transformations.
   (b) Explain the need for histogram equalization.

3. (a) State and explain convolution theorem on images.
   (b) Discuss various factors that influence the brightness of a pixel in an image.

4. The speed of a bullet in flight is to be estimated by using high-speed imaging techniques. The method of choice involves the use of a TV camera and flash that exposes the scene for K sec. The bullet is 2.5cm long, 2 cm wide, and its range of speed is 750± 250 m/s. The camera optics produce an image in which the bullet occupies 10% of the horizontal resolution of a 256 X 256 digital image.
   (a)) Determine the maximum value of K that will guarantee that the blur from motion does not exceed 1 pixel.
   (b) Propose a segmentation procedure for automatically extracting the bullet from a sequence of frames.

5. (a) List and explain various operators suitable for detection of diagonal edges.
   (b) Briefly explain how the crack edge relaxation is implemented.

6. (a) Define thinning. Explain the thinning morphological operation with an example.
   (b) Define thickening operation. Explain with an example.

7. (a) What do you mean by relative address coding?
   (b) Differentiate one dimentional and two dimentional Run length coding.
   (c) What are the advantages of white block skipping?

8. What are the types of compression used in image application. Mention the requirements of compression. Briefly explain.

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