(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2893 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VIII) THEORY EXAMINATION 2011-12

IMAGE PROCESSING

Time : 3 Hours *Total Marks : 100*

Note :– Attempt **all** questions. All questions carry equal marks.

1. Attempt any **two** parts of the following : **(2×10=20)**

   (a) What do you mean by Mach Bands ? Define light, luminance, brightness and contrast as related to image processing. Calculate the number of pixel frame for T.V. signal having bandwidth of $4MH_z$. and frame rate is 30.

   (b) What do you mean by Nyquist rate, alliasing and fold over frequency as related to sampling of images ? How the image is reconstructed from its samples ?

   (c) What do you mean by image quantizer ? What are the advantages of image quantizer ? Classify different types of image quantizer. Discuss uniform optimal quantizer.

2. Attempt any **two** parts of the following : **(2×10=20)**

   (a) Find the expression for DFT of an N×N image u(m,n) and the properties of this transform.

(b) Derive the mathematical expression for DCT and enumerate the properties of DCT.

(c) An Image matrix is given by :

$$f(m,n) = \begin{bmatrix} 1 & 1 & 2 & 1 \\ 2 & 1 & 1 & 2 \\ 1 & 3 & 2 & 1 \\ 2 & 1 & 2 & 1 \end{bmatrix}$$

Find the 2D Hadamard Transform of this image matrix.

3. Attempt any **two** parts of the following : **(2×10=20)**

(a) Draw the block diagram of a digital image restoration system and explain it. Classify the image restoration system and explain Wiener filter.

(b) For the image matrix given below compute the compression that can be achieved using Huffman coding of pixel values

$$f(m,n) = \begin{bmatrix} 3 & 3 & 3 & 2 \\ 2 & 3 & 3 & 3 \\ 3 & 2 & 2 & 2 \\ 2 & 1 & 1 & 0 \end{bmatrix}$$

(c) Show that the entropy is maximum when symbols are equiprobable.

4. Attempt any **two** parts of the following : **(2×10=20)**

(a) What do you mean by image segmentation ? Classify image segmentation techniques and discuss the amplitude thresholding method.

(b) What are the different classification techniques ? Differentiate between supervised and unsupervised technique. Discuss unsupervised method.

(c) Show that a two dimensional Gaussian is separable, while the Laplacian of a Gaussian operator is not separable.

5. Attempt any **two** parts of the following : **(2×10=20)**

(a) Define the moment for a two dimensional signal $f(x, y) \geq 0$. How different order of moments are useful in image recognition ? What are the different moment invariant related to image recognition ?

(b) Draw the block diagram of signature verification and explain its working.

(c) Discuss the finger print classification system with block diagram.