ANNA UNIVERSITY, CHENNAI- 25

End Semester Examinations – April/May 2011

Electronics and Communication Engineering

EC522 – VIII semester -Digital Image Processing (Common to all batches)

Time: 3 Hrs [FT-REGULAR] **Answer all Questions** **Max. Marks = 100**

Part – A **(10 x 2 = 20 marks)**

1. Draw a simplified monochrome vision model with its frequency response characteristics.
2. Compare JPEG, TIFF and GIFF image file formats.
3. What is sub-band coding in wavelet transform? Draw the first – level and second-level decomposition of the input image.
4. For the 2 x 2 transform A and the image U shown, calculate the transformed image V and basis image.

$$A = \frac{1}{2}\begin{bmatrix} \sqrt{3} & 1 \\ -1 & \sqrt{3} \end{bmatrix}, \quad U = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$$

5. What are point operators in image enhancement? State any three with the transformation.
6. Draw the block diagram of color image enhancement and state its significance.
7. Write a note on geometric transformations.
8. How image recognition is achieved by distance classifier and by correlation method.
9. What is JPEG and MPEG compression standard? List few features of it.
10. What is redundancy in images and how are they classified?

Part – B **(5 x 16 = 80 marks)**

11.i). What is Image Quantization? Derive and explain the various types of quantization with its properties and remarks .

ii). Prove that convolution in spatial domain is equal to multiplication in frequency domain

$$x(m,n) = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix} \text{ and } h(m,n) = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$$

12a.i). Find the 2D Hadamard transform for the image matrix shown below.

$$f(m,n) = \begin{bmatrix} 1 & 1 & 2 & 1 \\ 3 & 2 & 1 & 4 \\ 1 & 2 & 3 & 1 \\ 3 & 1 & 2 & 4 \end{bmatrix}$$

ii). Perform singular value decomposition of the matrix shown.

$$X = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ 1 & -1 \end{bmatrix}$$

(or)

b.i). Compute Haar transform for N= 8 and discuss their properties.

ii). Compute the DCT for N=4 and discuss their properties.

P.T.O.

13a.i). Can two different images have the same histogram? Justify your statement.

ii). A 4 x 4, 4 bits / pixel original image is shown below. (a). Apply histogram equalization to the image rounding the resulting image pixels to integers. (b). Sketch the histogram of original image and histogram equalized image.

$$\begin{bmatrix} 10 & 12 & 8 & 9 \\ 10 & 12 & 12 & 14 \\ 12 & 13 & 10 & 9 \\ 14 & 12 & 10 & 11 \end{bmatrix}$$

(or)

b.i). With neat diagrams explain the image enhancement procedure in frequency domain mode.

ii). With neat illustrations explain the principle of various linear spatial filtering.

14a.i). Discuss and derive the inverse filter approach restoration and Weiner filter approach restoration.

ii). Draw the block diagram of image degradation model and explain in detail.

(or)

b.i). Test the following pattern classes for linear seperability using the LMSE algorithm.

class 1 : $(-1,-1)$, $(1,1)$; class 2: $(-1,1)$, $(1,-1)$.

ii). Discuss the BPN algorithm with an application in image compression technique.

15a.i). Design Huffman code and Shanon – Fano code for the following symbols.

Symbol	Probability
P	0.4
Q	0.2
R	0.3
S	0.1

ii). Explain the procedure for block truncation coding and state few advantages.

(or)

15b.i). Encode the word "HELLO" by using arithmetic coding procedure.

ii). With neat diagrams explain the different types of vector quantization and state few applications.
