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**ANNA UNIVERSITY, CHENNAI- 25**  
**End Semester Examinations – Nov/Dec 2011**  
**B.E / Tech Full Time Electronics and Communication Engineering**  
**EC522 – VIII semester -Digital Image Processing**

**Time: 3 Hrs**

**Answer all Questions**

**Max. Marks = 100**

**Part – A**

**(10 x 2 = 20 marks)**

1. What are the elements of digital processing system?
2. Compare JPEG, TIFF and GIF image file formats.
3. What is Fourier transform? What is its role in image processing?
4. State the convolution and correlation theorems.
5. What are point operators in image enhancement? State any three with the transformation.
6. Write short notes on (i) Contrast stretching (ii). Gray level slicing (iii) Bit plane slicing.
7. What is gray level interpolation and give its significance in image processing?
8. State the perception rule for a 2 class problem.
9. Draw the block diagram of JPEG encoder and JPEG – DCT based decoder.
10. What is redundancy in images and how are they classified?

**Part – B**

**(5 x 16 = 80 marks)**

- 11.i). The image  $f(x,y) = 4 \cos 4 \pi x \cos 6 \pi y$  is sampled with  $\Delta x = \Delta y = 0.5$  and  $\Delta x = \Delta y = 0.2$ . The reconstruction filter is an ideal low-pass filter with bandwidth  $(1/2 \Delta x, 1/2 \Delta y)$ . What is reconstructed image in each case.
  - ii). Prove that convolution in spatial domain is equal to multiplication in frequency domain
- 12a.i). Find the 2D Hadamard transform for the image matrix shown below.

$$F = \begin{pmatrix} 2 & 2 \\ 2 & 1 \end{pmatrix}$$

- ii). Perform KL transform for the matrix shown.

$$(a) \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}, (b) \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

**(or)**

- b.i). Compute Haar transform for  $N=16$  and discuss their properties.
  - ii). Compute the DCT for  $N=4$  and discuss their properties.
- 13a.i). Discuss histogram, histogram equalization, median filter, image average and image subtraction with illustrations

(or)

- b.i). With neat diagrams explain the image enhancement procedure in frequency domain mode.
- ii). Design a 2D FIR filter using McClellan's transformation.

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

(or)

- b.i). 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

(or)

15b.i). Discuss the principles of block truncation coding and transform coding with Illustrations.

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

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