Register Number: ……..

M.E DEGREE EXAMINATIONS: NOV/DEC 2012

Third Semester

ANE508 DIGITAL IMAGE PROCESSING

Common to Applied Electronics and Communication Systems

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

1. Define Weber ratio.
2. What are safe colors?
3. What is sequency number? State its significance.
4. State the properties of a transform matrix.
5. What is a geometric mean filter? Where is it used?
6. What is a *tiepoint*? Give an example.
7. What is edge linking? Why is it required?
8. What is the role of descriptors in feature selection?
9. How will you remove Gaussian noise from an image?
10. Briefly state the various modes in JPEG.

PART B (5 x 16 = 80 Marks)

11. a) (i) With illustrations, explain brightness adaptation, brightness discrimination, simultaneous contrast and optical illusions of the human eye. (8)

    (ii) Explain the psycho-visual model for monochrome images. (8)

(OR)

b) (i) Derive the expression for quantization noise power in an image. Explain how it affects the image quality. (8)

(ii) Explain how the RGB safe color cube is obtained from the RGB color model. With two examples, show how they are converted to HIS values. (8)

12. a) (i) State and prove the translation properties of 2D DFT. (8)

    (ii) Obtain the Haar transform of the following image segment: (8)

$$\begin{bmatrix} 34 & 20 & 6 & 8 \\ 22 & 20 & 21 & 22 \\ 3 & 3 & 9 & 2 \\ 8 & 9 & 99 & 12 \end{bmatrix}$$

(OR)

b) (i) Explain the principle of KL transform. (8)

(ii) Obtain the Walsh-Hadamard transform of the following image segment: (8)

$$\begin{bmatrix} 4 & 2 & 7 & 8 \\ 2 & 2 & 21 & 22 \\ 30 & 3 & 8 & 1 \\ 8 & 8 & 5 & 2 \end{bmatrix}$$

13. a) (i) Develop an algorithm for histogram specification and apply it on an example of your choice. (8)

(ii) Explain how an image is enhanced using homomorphic filtering. (8)

(OR)

b) (i) Using the spatial filtering approach, low pass filter the image segment given below: (10)

$$\begin{bmatrix} 44 & 2 & 17 & 118 \\ 2 & 12 & 21 & 222 \\ 30 & 33 & 38 & 31 \\ 8 & 68 & 57 & 2 \end{bmatrix}$$

(ii) Describe the application of Weiner filter in image restoration. (6)

14. a) (i) Explain how the Laplacian operator is used in edge detection. (6)

(ii) Implement the above using a mask with an example of your own. (10)

(OR)

b) (i) Explain how a multilayer feed-forward neural network can be trained by back propagation. (10)

(ii) Explain how a neural network is used in shape recognition. (6)

15. a) (i) With neat diagrams, explain how wavelets could be used for image compression. (8)

(ii) The alphabets of a source and their respective probabilities are given below: (8)

X = {a, i, l, m, n, o, p, y}

P(X) = {0.1, 0.1, 0.2, 0.1, 0.1, 0.2, 0.1, 0.1}

Design Huffman code for the above source and compute the coding efficiency.

(OR)

b) (i) Compare DCT and wavelet based coding. (8)

(ii) The alphabets of a source and their respective probabilities are given below: (8)

$X = \{x_1, x_2, x_3\}$

P(X) = {0.7, 0.2, 0.1}

Generate a real-valued tag for the sequence $x_1\, x_3\, x_2\, x_1\, x_1\, x_2\, x_1\, x_1$

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