



B.E DEGREE EXAMINATIONS: NOV 2015

(Regulation 2009)

Seventh Semester (Fast Track)

ELECTRONICS AND COMMUNICATION ENGINEERING

ECE144 : Digital Image Processing

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The intensity range of 8-bit pixel image is
 - a) 0 to 7
 - b) 0 to 15
 - c) 0 to 31
 - d) 0 to 255
2. Which one of the following transformation possess high energy compaction property?
 - a) Walsh transform
 - b) Hadamard transform
 - c) Discrete cosine transformation
 - d) Harr transform
3. Which type of enhancement operations are used to modify pixel values according to the value of the pixels neighbors?
 - a) point operations
 - b) local operations
 - c) global operations
 - d) mask operations
4. Aachieves smoothing comparable to the arithmetic mean filter, but it tends to lose less image detail in the process.
 - a) median filter
 - b) geometric mean filter
 - c) spatial filter
 - d) Sobel filter
5. Restoration technique:
 - a) oriented toward modeling the degradation and applying the inverse process in order to recover the original image
 - b) oriented toward modeling the gradation and applying the inverse process in order to recover the original image
 - c) oriented toward modeling the degradation and applying the process in order to recover the original image.
 - d) attempts to reconstruct or recover an image that has been graded by using a priori knowledge of the gradation phenomenon.

6. is more robust to noise, and preserves high-frequency details.
 - a) Least mean square filter
 - b) Weiner Filter
 - c) Constrained least mean square filter
 - d) Geometric mean filter
7.view a coordinate (x,y) as a complex number (x = real part and y = imaginary part) then apply the Fourier transform to a sequence of boundary points.
 - a) Fourier descriptor
 - b) Laplace descriptor
 - c) Regional descriptor
 - d) Boundary descriptor
8.contributes significantly to algorithms for feature detection, segmentation, and motion analysis.
 - a) point detection
 - b) line detection
 - c) Edge detection
 - d) Region detection
9. Linear predictive coding will not lead to significant compression if
 - a) the image has uniform intensity values
 - b) the image is a natural one.
 - c) the image is very large in size
 - d) the image has only random noise with no spatial correlation
10. We have three binary images to encode using run-length coding. The first one is a checker-board image whose alternate pixels are black and white. The second one contains horizontal stripes of black and white in alternate lines. The third one contains vertical stripes of black and white – each having a width of 4 pixels. Rank according to the compressions achievable (highest to the lowest)
 - a) First, second, third
 - b) Second, third, first
 - c) Third, first, second
 - d) Third, second, first

PART B (10 x 2 = 20 Marks)

11. Find the number of bits required to store a 256 x 256 image with 32 gray levels.
12. Mention the three properties of unitary transform.
13. Differentiate between linear spatial filter and non-linear spatial filter.
14. How does image averaging help in image enhancement?
15. Mention the three methods of estimating the degradation function.
16. Give the difference between Enhancement and Restoration.
17. What are the two properties used for establishing similarity of edge pixels?
18. Differentiate between boundary and region in image representation.
19. Define inter-pixel redundancy.
20. Is it possible to convert a gray-scale image into bit-planes? Brief your answer.

PART C (5 x 14 = 70 Marks)

21. a) (i) Describe Image Formation in the eye with Brightness adaption and discrimination (7)

(ii) Explain image sampling and quantization. (7)

(OR)

b) (i) Using the recursive formula for generating the Hadamard transform prove that these matrices are orthogonal. (7)

(ii) State and prove separability property of 2D-DFT. (7)

22. a) (i) If all the pixels in an image are shuffled, will there be any change in the histogram? Justify your answer. Perform histogram equalization of the given image $f(x,y)$.

$$f(x,y) = \begin{bmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{bmatrix}$$

(OR)

b) (i) Illustrate how mean filters are useful in image enhancement. (7)

(ii) Explain how homomorphic filtering is used in separating illumination and reflectance components. (7)

23. a) Describe any four noise models that affect images.

(OR)

b) Describe how constrained least square approach is used for image restoration. Derive its transfer function.

24. a) Explain how thresholding is helpful in segmenting images. Write the limitations of global thresholding. With appropriate mathematical support derive an optimal global and adaptive threshold that produces minimum average segmentation error.

(OR)

b) Illustrate the representation of an image using chain codes and polygonal approximation. Compare the performances of each technique.

25. a) (i) List out the types of error free compression techniques. Explain how image compression is achieved through Run length encoding. (7)

(ii) Draw and explain a general compression system model. Explain how (7)
compression is achieved using transform coding.

(OR)

b) (ii) With a block diagram explain the principles behind compressing images using (7)
JPEG.
