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Question Paper Code : 41147

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Sixth/Eighth Semester

Electronics and Communication Engineering

CS 1002 — DIGITAL IMAGE PROCESSING

(Common to Seventh Semester – Computer Science and Engineering and Information Technology)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by spectral density?

2. Write an expression to determine the no. of bits needs to store a digitised image.

3. What is the principle of mask processing?

4. Why does the discrete histogram equalisation technique not yield a flat histogram, in general?

5. What are the basic operations in a geometric transformation used for image restoration?

6. Draw the model of image restoration process.

7. How does psychovisual redundancy differ from other redundancies?

8. Define compression ratio.

9. What are the properties of second derivative around an edge?

10. What are the difficulties in region growing?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the conditions to be satisfied by a distance function? Illustrate the concepts of Euclidean distance, D_4 distance and D_8 distance, with examples. (10)

(ii) How much time would it take to transmit a 1024 × 1024 image with 256 gray levels using a 56 K bits per sec modem. Assume that transmission is accomplished in packets consisting of a start bit, 8 bits of information and a stop bit. What would be the time if the modem is replaced with another one operating at 750 K bits per sec? (6)

Or

(b) (i) Explain the concepts of convolution and correlation and their similarities. (8)

(ii) Obtain the Fourier transform of a 2 × 2 image [3 4; 1 2]. (8)

12. (a) (i) Illustrate the principle of histogram equalization with an example. (8)

(ii) Discuss the principle of smoothing using various masks. (8)

Or

(b) (i) Explain the principles of high-boost filtering and its application. (8)

(ii) Discuss the effects of ideal low pass and high pass filters with cut off frequencies at different radii. (8)

13. (a) (i) Discuss the different types noise models considered in image degradation. (8)

(ii) Explain how SVD of an image is obtained. (8)

Or

(b) (i) Illustrate the principle of inverse filtering approach to image restoration. (8)

(ii) Discuss the applications of Wiener filter and compare it with inverse filter. (8)

14. (a) (i) Construct the Huffman's code for the following set of source symbols and their probabilities. Also calculate the average length of the code. (6)

Source symbol	Probability
S_1	0.19
S_2	0.18
S_3	0.17
S_4	0.12
S_5	0.11
S_6	0.10
S_7	0.08
S_8	0.05

(ii) What is the principle of arithmetic coding? Perform arithmetic coding for a six symbol message S_1, S_3, S_2, S_4, S_6, S_5 from the source given below : (10)

Source symbol	Probability
S_1	0.35
S_2	0.25
S_3	0.10
S_4	0.15
S_5	0.05
S_6	0.06
S_7	0.04

Or

(b) (i) Consider the following 4 × 4 8-bit image

40	40	40	40
40	40	40	40
90	90	90	90
90	90	90	90

Perform LZW coding with a suitable dictionary. (10)

(ii) Discuss the principle of PCM briefly. What is the need for non-uniform quantisation in PCM? (6)

15. (a) Describe the techniques of region splitting and merging and its variations. (16)

Or

(b) (i) Illustrate how chain codes are used to represent a boundary based on 4 or 8 – connectivity of the segments. Give an example. (10)

(ii) What is the need for polygonal approximations? Illustrate the method of finding the minimum perimeter polygons. (6)