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Question Paper Code : 21331

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

Seventh Semester

Electronics and Communication Engineering

EC 2029/EC 708 — DIGITAL IMAGE PROCESSING

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define optical illusion and mach band.
2. Define checker board effect and false contouring.
3. Give the PDF of Gaussian noise and plot it.
4. Define and give the transfer function of contraharmonic filter.
5. Define image degradation model and sketch it.
6. Define rubber sheet transformation.
7. Write Sobel horizontal and vertical edge detection masks.
8. Define region splitting and merging.
9. State the optimality conditions for Huffman code.
10. State the need for data compression.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the basic concepts of sampling and quantization with neat sketch. (8)
(ii) Find DCT Transform and its inverse for the given 2×2 image [3 6; 6 4]. (8)

Or

(b) Obtain forward KL transform for the given vectors.

$X_1 = [1 \ 0 \ 0]$; $X_2 = [1 \ 0 \ 1]$; $X_3 = [1 \ 1 \ 0]$ (Transpose these vectors) and analyze how the principal components are used for remote sensing applications? (16)

12. (a) Describe histogram equalization. Obtain Histogram equalization for the following image segment of size 5×5 ? Write the inference on image segment before and after equalization. (16)

20 20 20 18 16
15 15 16 18 15
15 15 19 15 17
16 17 19 18 16
20 18 17 20 15 (5×5) matrix

Or

(b) (i) Describe how homomorphic filtering is used to separate illumination and reflectance component? (8)

(ii) How mean filters are used for image enhancement. (8)

13. (a) Describe constrained least square filtering for image restoration and derive its transfer function. (16)

Or

(b) (i) Explain the concept of geometric transformation for image restoration? (8)

(ii) How wiener filtering is helpful to reduce the mean square error? (8)

14. (a) (i) How do you link edge pixels through global processing? (8)

(ii) Describe Watershed segmentation algorithm. (8)

Or

(b) (i) Explain region based segmentation and region growing with an example. (8)

(ii) Discuss how to construct dams using morphological operations? (8)

15. (a) (i) Briefly explain Transform coding with neat sketch? (8)
- (ii) A source emits letters from an alphabet $A = \{a_1, a_2, a_3, a_4, a_5\}$ with probabilities $P(a_1) = 0.2, P(a_2) = 0.4, P(a_3) = 0.2, P(a_4) = 0.1$ and $P(a_5) = 0.1$. (8)
- (1) Find a Huffman code for this source?
- (2) Find the average length of the code and its redundancy?

Or

- (b) (i) Generate the tag for the sequence 1 3 2 1 for the probabilities $P(1) = 0.8, P(2) = 0.02, P(3) = 0.18$ (8)
- (ii) How an image is compressed using JPEG Image compression standard? (8)