

2125
B.E. (Computer Science and Engineering)
Seventh Semester
CS-701: Digital Image Processing

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.

x-x-x

I. Answer the following:-

- a) Define sampling and quantization in digital imaging.
- b) What is a histogram?
- c) State any two properties of the Fourier Transform.
- d) What is homomorphic filtering used for?
- e) Define coding redundancy.
- f) What is the main objective of region growing segmentation?
- g) State any one advantage of using morphological operations.
- h) Define boundary descriptors.
- i) What is a color model? Give one example.
- j) What is the difference between lossless and lossy compression? (10x1)

UNIT - I

- II. a) Explain the complete digital image processing pipeline with a neat diagram.
b) A grayscale image of size 512×512 is quantized from 8 bits to 4 bits.
 - i) Compute the new number of gray levels.
 - ii) Discuss the effect of this quantization on the perceived quality of the image. (5,5)
- III. a) Discuss histogram equalization. Illustrate its effect with a sample intensity transformation curve.
b) Explain spatial filtering with examples of at least two filters (one smoothing, one sharpening).
c) Compare and contrast spatial domain and frequency domain enhancement techniques. (4,4,2)

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(2)

- IV. a) Derive and explain the degradation–restoration model.
b) Describe any two noise models and write the mathematical form of their probability density functions.
c) Explain the principle of inverse filtering. Highlight its limitations. (4,3,3)

UNIT - II

- V. a) Explain Huffman coding with an example using a set of given symbol probabilities.
b) Differentiate between
i) coding redundancy
ii) interpixel redundancy
iii) psychovisual redundancy
c) Write a short note on JPEG compression workflow. (4,3,3)
- VI. a) What is edge detection? Compare Sobel, Prewitt, and Canny edge detectors.
b) Explain thresholding-based segmentation. What is Otsu's method?
c) Discuss the Hough Transform for line detection. (4,3,3)
- VII. a) Explain region splitting and merging with a step-by-step procedure.
b) Describe boundary representation and give examples of two boundary descriptors.
c) What are regional descriptors? Explain any one in detail. (4,3,3)