Question Bank
Digital Image Processing
(8CS2A/IT2A)
Subject In-Charge: Shashi Kant Sharma

Unit-1 Digital Image Fundamentals

1. Explain the fundamental steps involved in image processing with neat and clean diagram.
2. Explain the various components of image processing system.
3. Write a short not on fundamental image file formats.
4. Explain Image Acquisition and the different arrangements used to acquire the images.
5. Explain image sampling and quantization in detail.
6. Write a short note on image interpolation
7. Write a short note on Zooming and Shrinking of the Images.
8. Write a short note on RGB and HSI color models.
9. Differentiate between conventional Sensor and CCD Sensor.
10. Explain the concept of image representation and differentiate image compression and representation.

Unit -2 Basic Image Operations

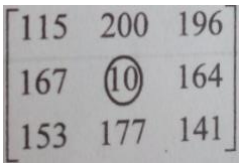
1. What do you understand by Gamma (Power Law) Transformation? Explain the gamma correction used for image enhancement.
2. What do you understand by Histogram equalization? Explain the same using a proper example.
3. Discuss the various properties of Discrete Fourier Transform (DFT).
4. Explain frequency domain filters in details.
5. Define spatial correlation and convolution with an example.
6. Write a short note on various spatial domain filters with their coordinate equations.
7. Explain Bit Plane Slicing and Contrast Stretching.
8. Perform the Histogram Equalization on the image given in table:

r_k	n_k
0	1000
1	1200
2	32
3	56
4	980
5	544
6	250
7	34

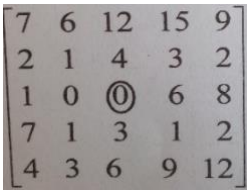
9. What do you understand by the term “Histogram Stretching”. Perform histogram stretching on the image given below so that new image has a dynamic range of (0,8).

Gray Level	0	1	2	3	4
No. of Pixels	100	0	90	85	70

10. Show the intensity value of marked pixel, when given image is filtered using 3x3 average mask.



11. Write the masks for laplacian and sobel operators.
12. What is the output intensity value of marks pixel in the following image after a 5x5 median filter.



13. What do you understand by Fourier transform? Explain 1-D and 2-D Fourier transform.

Unit- 3 Image Restoration

1. Discuss the image degradation/restoration model with neat and clean diagram.
2. Explain following noise models (any Four):
    a. Gaussian Noise Model
    b. Rayleigh Noise Model
    c. Gamma Noise model
    d. Exponential Noise Model
    e. Uniform Noise Model
    f. Salt & Pepper (Impulsive) Noise Model
3. Explain Adaptive Filters (Adaptive mean and Adaptive Median Filters).
4. Explain Inverse Filtering in details.
5. Write a note on Weiner (MMSE) Filter
6. What do understand by Homomorphic Filter? Explain the Homomorphic filter in detail.
7. Design Homomorphic filter. Explain the working of Homomorphic filter. How do we get back the modified image?
8. Explain general image restoration models.

Unit-4 Image Compression

1. Write short note on :
    a. Coding Redundancy
    b. InterPixel Redundancy
    c. Psychovisual Redundancy
    d. Compression Ratio

2. Explain Lossy Compression Techniques
3. Write a short note on: Lossy Predictive Coding
4. Write a Short note on: Lossless Predictive Coding
5. Explain JPEG Compression technique in Details with its steps.
6. Apply Huffman coding on the image whose information is given below. Compute the effectiveness of the Huffman coding.

Symbol	Probability
a1	0.1
a2	0.4
a3	0.06
a4	0.1
a5	0.04
a6	0.3

7. What do you understand by Image Compression? Draw the neat and clean model for image compression. Explain each step used in image compression procedure.
8. Calculate: (a) Entropy of code1 (b) Entropy of Code2 (c) Compression Ratio (d) Coding Redundancy (e) Total number of bit for code1 (f) Total Number of bit for code 2.

Symbol	**Probability**	**Code1**	**Code2**
A0	.19	000	11
A1	.25	001	01
A2	.21	010	10
A3	.16	011	001
A4	.08	100	0001
A5	.06	101	00001
A6	.03	110	000001
A7	.02	111	000000

9. Given 3 points, use Hough transform to draw a line joining these points (1, 1), (2, 2) and (3, 3).
10. Given 5points, use Hough transform to draw a line joining these points (1, 4), (2, 3), (3, 1), (4, 1) and (5, 0).

Unit-5 Image Segmentation

1. Write the coordinate equations for various edge detections masks. Also write the various masks used for edge, line and point detection.
2. Explain thresholding in details. Describe local and global thresholding.
3. Explain Hough Transform.
4. Discuss Region based Segmentation. (Region Splitting and Region Growing)
5. Explain point, line and edge detection.
6. Explain boundary descriptors.
7. Describe edge linking and boundary linking.