Registration Number: _____

Name: _____

Branch & Section: _____

SRM UNIVERSITY – AP, ANDHRA PRADESH

End Term Examinations, Dec 2023.

[Question Paper ID: **004855]**

Subject Title	:	Digital Image Processing	**Subject Code**	:	CSE314
Batch	:	2020	**Max Marks**	:	100
Degree	:	B.Tech.	**Duration**	:	3 Hours
Branch	:	CSE	**QP Set**	:	---

Part A: Answer for any 10 questions out of 12 questions (10 × 4 Marks = 40 Marks) **Marks**

Answer **any 10** Questions

1. What is illuminance and reflectance? Define an image in terms of illuminance and reflectance. What signal processing techniques you will apply to get an analog image converted into a digital image. [1 Marks+ 1 Marks + 2 Marks] 4
2. Discuss about various Low Pass and High Pass Filters applied in the spatial domain. [2 Marks+2 Marks] 4
3. What is the use of performing Bit Plane Slicing over an Image. Perform Bit Plane Slicing over the given Image values. Change the Least significant bits to zero then show the new image pixel values. [4 Marks] 4

7	6	5
4	3	2
1	1	0

4. What is 2-D convolution? What is a 2-D Fourier Transform? [2 Marks+2 Marks] 4
5. Why do we need to multiply (-1)x+y with f(x,y) before Fourier Transform? What is the difference between Spatial domain and frequency domain filtering? [2 Marks+2 Marks] 4
6. Write short note on Linear and Non-linear filters with applications [4 Marks] 4
7. Write name of any four Image Edge Detection Operators with their mask values [4 Marks] 4
8. Write any two advantages and two Limitations of Sobel Operator and Prewitt Operator [2 Marks+2 Marks] 4
9. Describe the following color model used in image processing (a) RGB (b) CMYK [4 Marks] 4
10. Convert RGB values (R=24, G= 98, B = 118) to HSI in the range [0-1]. [4 Marks] 4
11. Write down some names of Infrared (IR) detectors and visual light detectors? Write down four applications of thermal imaging. [4 Marks] 4
12. Draw the basic block diagram of the camera for imaging and explain these. [4 Marks] 4

Part B (Answer Any 4 out of 6 questions) (4 × 15 Marks = 60 Marks) **Marks**

Answer **any 4** Questions

13. What are differences between Histogram Equalization and Histogram Specification (Matching)? Apply histogram specification to the image given below. Let us consider target mapping for gray levels 0-7 be 0,0,1,2,2,3,6,7. Show the resultant image values after final mapping [5 Marks +10 Marks] 15

1	3	4	5
5	6	6	6
7	7	7	7
5	5	5	5

14. (a) Explain in details about the Smoothing and Sharpening operation of an image using Frequency-Domain Filters. [7 Marks] 15
(b) Explain Common Noise Models and different type of filtering methods for image Restoration [8 Marks]

15. Describe image segmentation with its 4 applications. Apply Splitting and Merging on the following image with thresholding value equal to 3. [5 Marks + 5 Marks + 5 Marks] 15

5	6	6	7	6	7	6	6
5	7	6	7	5	5	4	7
6	6	4	4	3	2	5	6
5	4	5	4	2	3	4	6
1	1	0	1	0	3	4	7
0	0	0	2	2	1	5	6
0	3	2	3	3	2	4	7
1	0	1	0	2	3	5	4

16. (a) Using Hough Transform, show that the following given points are collinear. Also find the Equation of line using points (1,2), (2,3) and (3,4). [5 Marks] 15
(b) Using Otsu's thresholding method, calculate the optimum threshold value for segmenting the following image. [10 Marks]

0	1	2	1	0	0
0	3	4	4	1	0
2	4	5	5	4	0
1	4	5	5	4	1
0	3	4	4	3	1
0	2	3	3	2	0

17. (a) Apply Huffman coding and find the a) Average Length of code, b) Entropy and c) Efficiency. The symbols (like intensity levels) and their corresponding probabilities of occurrence (in sorted descending order) are given in the following Table. [5 Marks +3Marks +1Marks] 15

S1	S2	S3	S4	S5	S6	S7
0.25	0.25	0.125	0.125	0.125	0.0625	0.0625

(b) Briefly explain about various Image compression Techniques? Write 2 key differences between Lossless and Lossy Compression. [4 Marks+ 2 Marks]

18. (a) What are the differences between Cooled and Uncooled Thermal Imagers? Which is better and why? Write down the applications of these for the defense market? [6 Marks] 15
(b) What is a Convolution Neural Network? Draw a simple CNN architecture with Input Layer, Convolutional Layer, Activation Layer, Pooling Layer, Flattening, Fully connected layer and Output Layer and explain how it works for feature extraction and classification? [9 Marks]

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