VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of the UGC Act, 1956)

Reg. No. : 21BCE5062

Final Assessment Test (FAT) - May 2024

Programme	B.Tech.	Semester	WINTER SEMESTER 2023 - 24
Course Title	DIGITAL IMAGE PROCESSING	Course Code	BCSE403L
Faculty Name	Prof. Joshan Athanesious J	Slot	E2+TE2
		Class Nbr	CH2023240501736
Time	3 Hours	Max. Marks	100

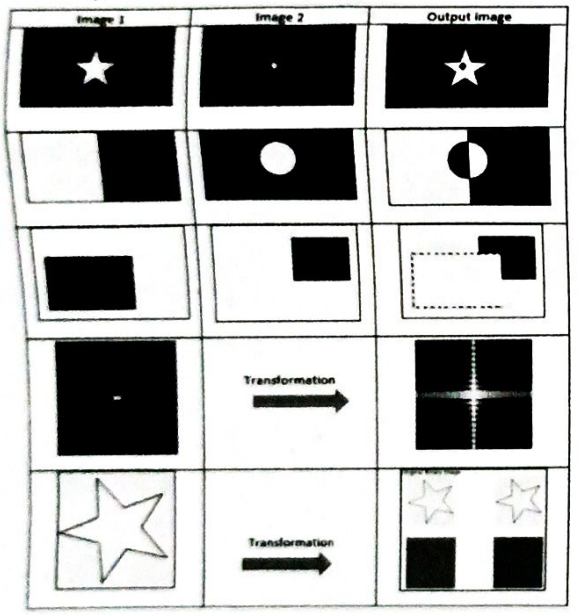
General Instructions:

- Write only Register Number in the Question Paper where space is provided (right-side at the top) & do not write any other details.

Section - I

Answer all questions (4 X 10 Marks = 40 Marks)

01. Identify the suitable math tools used for the given images and provide explanations for each. [10]



02. i. Create a histogram plot to visualize the distribution of gray levels in the image. (3) [10]

ii. Perform histogram equalization on the below table and create a plot to display the equalized image. (7)

Range of intensity values	0	1	2	3	4	5	6	7
Frequency of values	1	6	8	2	8	2	1	2

03. a) Consider a 2M x 2M-pixel gray level real image that is zero outside ($-M \le x \le M$ and $-M \le y \le M$). The image is symmetric around the origin [f(x, y) = f(-x, -y)]. Prove that the 2-D DFT of the image is real only and does NOT have an imaginary component.[6 marks] [10]

b) A 6x 6 image has an average pixel value of 12. Find F(0,0), where F(u, v) is the 2-D DFT of the image. [2 marks]]

c) The 2-D DFT of an image is 7+j7, where j=sqrt[-1]. Find power content of the image signal and Phase angle of the image [2 marks]

04. a. A VIT student wants to reproduce a christmas star symbol from a printout in his mobile phone. All pixels from the star have normalized CMYK value (0.6, 0.4, 0.0, and 0.2). The mobile phone application needs input in RGB format. Maximum intensity value is 255 for both the printer and phone. [10]

Determine equivalent RGB Values. [5 marks].

b. Explain 'pseudo color processing and its usefulness in analysis of geographic images with an example [5 marks]

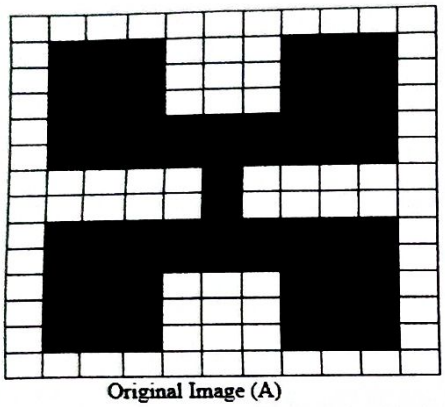
Section - II

Answer all questions (4 X 15 Marks = 60 Marks)

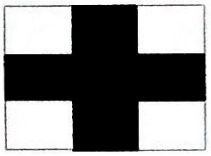
05. Use the structuring element (S) to perform the following operations: [Each 7.5 Marks] [15]

a. Retrieve the four mathematical objects from the given Image (A) and name the image as B

b. Enlarge the size of the retrieved objects in the resultant image B



Original Image (A)



Structuring Element (S)

06. Consider the image, which is represented as a matrix. Use the divide and contour-based segmentation algorithms to separate the three distinct shapes from their backgrounds. [15]

1	1	1	0	0	0
1	1	1	0	2	2
1	1	1	0	2	2
0	0	0	0	2	2
0	4	0	0	0	0
4	4	4	0	0	0

07. [i] AVT Technologies has hired you as an 'Image Processing' consultant for a 'Texture Analysis' project. Explain the LBP [local binary pattern] algorithm and its use in texture analysis. Explain what its main disadvantage is. [7 marks] [15]

[ii] AVT Technologies has won a project for 'wildlife monitoring" in Mudumalai Sanctuary for non-invasive monitoring of wildlife. Images from stationary Cameras and images captured from drones are analyzed to track individual animals. Programmers from AVT found it difficult to locate same animal in different sized images. Suggest an algorithm that could be used in this scale and rotation variance.[8 marks]

08. Mr. Bean received the following symbol table showing their probability and frequency. He also received a tag value of 0.74304 of a coding technique. With this data can you help him to decode and understand the transmitted information and determine the coding technique? [15]

Symbol	A	D	I	N
Probability	0.2	0.4	0.2	0.2
Sub-range	0.0-0.2	0.2-0.6	0.6-0.8	0.8-1.0