299437

Course Name: Digital Image Processing

Course Outcome

CO1- Understand mathematical formulation of an image, its processing steps and relationship between image pixels.
CO2- Apply Image enhancement using intensity transformations and spatial filtering.
CO3- Analyze image enhancement for frequency domain using Fourier transform
CO4- Formulate region of interest through morphological operations.
CO5- Evaluate strongly co-related regions obtained through Segmentation using discontinuity and homogeneity-based segmentation techniques
CO6: Describe an object of an image using Shape Number and Boundary descriptors.

Printed Pages: 4 **University Roll No. .....**

End Term Examination, Even Semester 2024-25

Program (CS/AIML/CCV/CSIDA), III Year, VI Semester

Subject Code & Subject Name- BCSE 0101 & Digital Image Processing

Time: 3 Hours **Maximum Marks: 50**

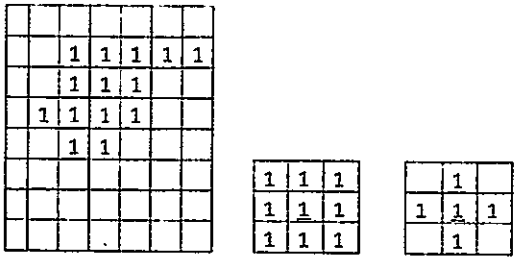
Instruction for students:

1. All parts of a question should be answer at one place
2. First complete the one set of section then start a new section.

Section – A

Attempt All Questions 4 X 5 = 20 Marks

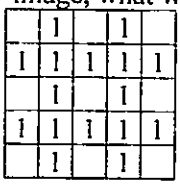
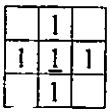
No.	Detail of Question	Marks	CO	BL	KL
1	What are the main components of an image processing system. Describe with the suitable diagram and what role does each component play?	4	1	R	F
2	Given a 3X3 grayscale image matrix with pixel values (0-255). Apply the following transformation: Image Negative, Log & Power Law with c=1, γ=1.2. $\begin{bmatrix} 0 & 50 & 100 \\ 150 & 200 & 220 \\ 240 & 250 & 255 \end{bmatrix}$	4	2	An	P
3	Compute the 2D-DFT for the signal as shown in fig $\begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 2 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$	4	3	U	C
4	Perform the following morphological operation on the digital image I using the structuring element B1 and B2 as shown in figure. $y = (I \oplus B1) \ominus B2$	4	4	An	C

					
5	Explain how you would apply the complete Canny Edge Detection algorithm to detect the document boundaries in the photo. Describe each stage of the algorithm in the order it is applied, and explain the purpose of each step. Also, discuss any specific adjustments you might consider to optimize edge detection for varying lighting & background clutter.	4	5	U	P

Section – B

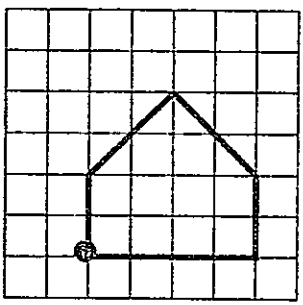
Attempt All Questions 3 X 5 = 15 Marks

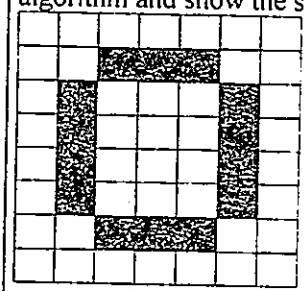
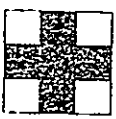
No.	Detail of Question	Marks	CO	BL	KL
6	Explain Convex Hull. What is the shortcoming of the procedure and how will you remove it.	3	4	R	C
7	What are the different thresholding methods for segmentation. Write down the basic global thresholding algorithm.	3	5	U	P
8	Given a set of points, use Hough Transform ($p = x\cos\theta + y\sin\theta$) to join these points (0,5) (1,4) (3,2) (3,3) (5,0). Mention your answers in following steps. Step 1. Equation corresponding to the points. Step 2. Equation of the line on which majority of the points lie.	3	6	An	C
9	Discuss the step-by-step procedure for the detection of isolated point for the following digital image shown in Figure. 10 10 10 10 10 10 2 10 10 10 10 10 10 10 10 10 10 10 3 10 10 10 10 10 10	3	5	U	C

10	You are working with a 5X5 binary image which contains a pattern and a structing element. a) Explain how the hit or miss transform can be applied to detect the center points. b) After applying the hit or miss transform on the image, what will be the output of the image.  Image  Structuring Element	3	4	A	C

Section – C

Attempt All Questions 5 X 3 = 15 Marks

No	Detail of Question	Marks	CO	BL	KL
11	Find the following shape description of the given shape (black circle is the origin and move in the clockwise direction). a) Chain Code b) First Difference c) Circular First Difference d) Shape Number e) Order 	5	6	An	C
12	Consider the image. Show the result of the Region Growing along with Split & Merge Algorithm using Quad Tree representation. Let the predicate be threshold ≤ 3 & seed point as 0 and 6.	5	5	An	C

	5 6 6 6 7 7 6 6 6 7 6 7 5 5 4 7 6 6 4 4 3 2 5 6 5 4 5 4 2 3 4 6 0 3 2 3 3 2 4 7 0 0 0 0 2 2 5 6 1 1 0 1 0 3 4 4 1 0 1 0 2 3 5 4				
13	In a medical image application, you are given a binary image of a cross-sectional scan where tumor region appears as enclosed black areas surrounded by white tissue structures. Some of these black regions are completely surrounded and some are connected to the background. You are asked to automatically fill only the completely enclosed black regions, leaving the rest untouched. Name the algorithm used to fill the enclosed region. Apply the algorithm and show the stepwise output image.  Image  Structuring Element	5	4	U	C