U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

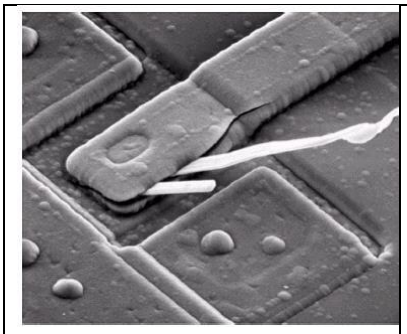
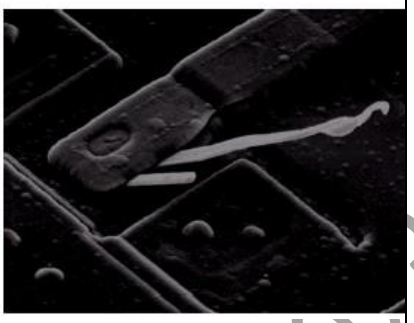
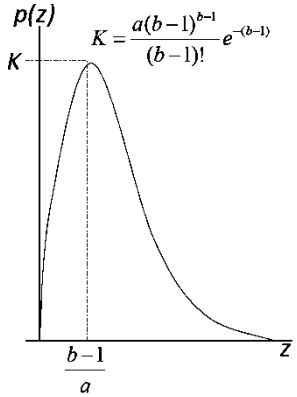
January 2024 Semester End Main Examinations

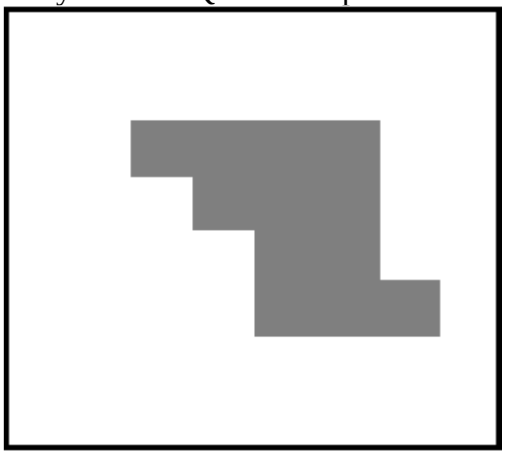
Programme: B.E. **Semester: VII**
Branch: ES – Cluster Elective **Duration: 3 hrs.**
Course Code: 19ET7CE2IP **Max Marks: 100**
Course: Image Processing

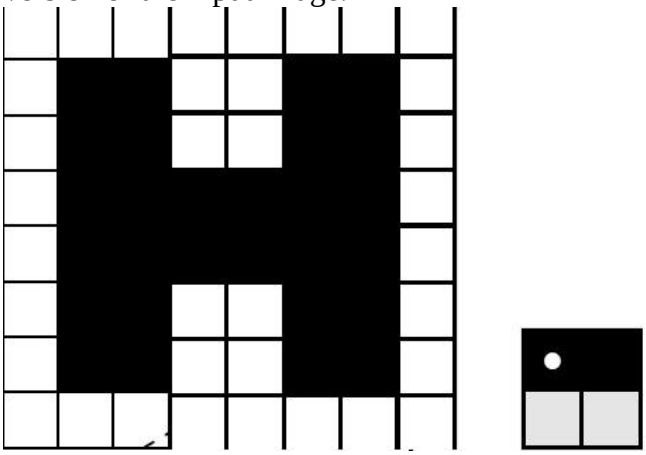
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		Define the term 'Image'. Analyze the components of an Image Processing system with relevant diagram.	CO1		**06**
	b)		With a neat sketch, explain microdensitometer image acquisition system.	CO1		**06**
	c)		Consider the image segment shown below: (i) Let **V = {4, 5, 6}** and compute the length of the shortest 4,8 and m - path between **p** and **q**. If a particular path does not exist between these two points, explain why? (ii) Repeat the above problem considering **V = {5, 6, 7}** 3 4 6 6 (**q**) 6 6 7 5 5 4 4 7 (**p**) 6 7 7 4	CO2	PO1	**08**
			UNIT - II			
2	a)		Given an image of size 3X3 as shown below, determine the output image g(x,y) using logarithmic transformation **$g(x,y) = C \log_{10}(1 + f(x,y))$** by choosing : (i) C = 2 and (ii) $C = L / \log_{10}(1+L)$ $f(x,y) = \begin{bmatrix} 132 & 209 & 178 \\ 255 & 29 & 187 \\ 69 & 108 & 222 \end{bmatrix}$	CO2	PO1	**06**
	b)		Explain the process of frequency domain filtering with a neat block diagram.	CO1		**06**

		c)	With appropriate diagram, derive the expression for a filter developed on the basis of Illuminance-Reflectance model.	*CO2*	*PO1*	**08**
			OR			
	3	a)	For the input image given below apply a suitable Gaussian filter to obtain the output image and comment on the output obtained. Also explain the various properties of Gaussian filter.  **Original Image**  **Output Image**	*CO3*	*PO2*	**06**
		b)	Analyze the type of image enhancement to be used with relevant graphs for the following cases: i. Gamma correction and contrast manipulation of an image ii. Highlighting a specific range of gray levels in an image	*CO2*	*PO1*	**06**
		c)	The Histogram of an 8 – level image is as shown below. Analyze and sketch the Histogram of Equalized image and comment on the output image. 8 8 8 8 6 8 9 8 6 9 9 9 6 8 9 8	*CO2*	*PO1*	**08**
			UNIT - III			
	4	a)	For the noise model given below, write the PDF expression, the mean and variance of the PDF.  	*CO2*	*PO1*	**06**
		b)	With relevant terminologies and diagram, derive the expression for an Image restoration/degradation model. Also derive the expression for a simple inverse filter with relevant comments about its working principle.	*CO1*		**06**

		c)	For the image given below apply the following filters and comment on the output obtained. i. Median filter of size 3 X 3 ii. Mid-point filter with respect to marked pixel iii. Arithmetic mean filter encompassing sub-image of 3 X 3 with a + shape of the mask 255 121 99 52 0 102 155 19 69	*CO2*	*PO1*	**08**
			UNIT - IV			
	5	a)	Define the following: i. Radiance ii. Luminance iii. Brightness iv. Hue v. Saturation vi. Tristimulus values	*CO1*		**06**
		b)	Explain the two different methods of color image quantization with relevant equations and examples.	*CO1*		**06**
		c)	Perform RGB to HSI conversion for the RGB color image given below: $\begin{bmatrix} 100,100,100 & 150,0,0 & 0,150,0 \\ 255,0,0 & 255,255,255 & 0,0,0 \\ 100,150,200 & 0,0,255 & 100,200,150 \end{bmatrix}$	*CO2*	*PO1*	**08**
			OR			
	6	a)	Analyze briefly the two color filter methodologies used in color image processing with appropriate block diagrams.	*CO2*	*PO1*	**10**
		b)	Analyze the CIE Chromaticity Diagram. Write the equation for conversion of the tristimulus values to RGB values and vice-versa.	*CO2*	*PO1*	**10**
			UNIT - V			
	7	a)	Apply split and merge technique to segment the image shown below and thereby write its Quadtree representation. 	*CO4*	*PO4*	**10**

		b)	The input image and structuring element are given below. Find the eroded version of the input image. 	*CO4*	*PO4*	**10**

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