Exam Date & Time: 01-Jun-2023 (02:30 PM - 05:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

SIXTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, MAY 2023 DIGITAL IMAGE PROCESSING [CSE 4052]

Marks: 50

A)

Duration: 180 mins.

E

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) Along with the diagram explain how the image forms in the human eye?

(5)

- B) Distinguish the various resolution terms in digital image processing (3)
- C) With the equation, write a simple program (in programming language of your choice) to calculate the image negatives on a 5x5 image (2)
- 2) For the analog signal shown in Fig. 2A, how do you write the graph showing the samples in the discrete domain? Show the appropriate symbols
 - A)



(3)

Fig 2A: Analog signal representation

	B)	Why do we multiply $(-1)^{(x+y)}$ in the frequency domain processing of any image?	(2)
	C)	Write the equation and show the filter through a neat diagram of the Ideal low pass filter in the frequency domain. Why on the 2D plot of this function, the filter is half cut?	(5)
3)		With a diagram, illustrate the image degradation and restoration process	
			(4)
	A) B)	Discuss the arithmetic mean filter to reduce the noise in an image	(4)
	C)	Estimate the noise density when probability of salt noise is 2% and of pepper noise is 3%	(2)
4)		Discuss the three steps performed typically for edge detection	(2)
	A)		(2)
	B)	Recall and write the Prewitt and Sobel masks (2 in Sobel and 2 in Prewitt) for the diagonal edge detection	(4)
	C)	Develop a program in programming language of your choice to implement the Prewitt edge detection in four directions	(4)
5)		Write the mathematical notations for the following morphological image processing.	
		a. A eroded by B	
	A)	b. A dilated by B	
		c. A opened by B	(3)
		d. A closed by B	(3)
		e. A hit or miss by B	
		f. A thinning by B through hit-or-miss.	
	B)	Apply the opening and closing operation on the following figure with the circular structuring element and show the output	

(4)

(3)



C) What is the mathematical formula for calculating the magnitude and direction of the gradient vector?

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