Total number of printed pages: 10 **Programme(UG)/7th/UCSE715 (Comp.)**

2024

DIGITAL IMAGE PROCESSING

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	**Answer the following questions:**		
	a)	**Fill in the blanks:**	1x8=8
		(i) The output intensity level (s) is low at the high value of input intensity value (r) for _____function. **(ii)** _____noise can be handled by the harmonic filter. **(iii)** High pass filter passes_____ frequencies. **(iv)** Subtractive primary Colors are____. **(v)** Monotonically increasing function in the interval _____. **(vi)** Contrast stretching expands the range of _____ in an image. **(vii)** Thinning is the morphological dual of _____. **(viii)** Smoothing filter are used for _____and _____.	
	b)	**True or False:**	1x12=12
		(i) Low level of processing is required for enhancing the image from the low contrast image. **(ii)** Dilation shrinks the size of background objects. **(iii)** Erosion closes holes and gaps. **(iv)** Dilation expands the size of foreground objects. **(v)** Opening and dilation operations are not duals of each other. **(vi)** Harmonic mean filter is used to handle both salt and pepper noise. **(vii)** Harmonic mean filter handle pepper noise. **(viii)** Addition of noisy images helps in noise reduction. **(ix)** CMY model is not good for human interpreting. **(x)** Contrast stretching didn't improve the quality of low contrast image. **(xi)** Image negative obtained using set complementation. **(ix)** Color complement replaces with opposite color in the color circle of Hue component.	
2.	**a)**	Describe an image formation model?	5
	c)	Perform the histogram equalization transformation function (S_k) for discrete values with calculation of PDF $p_r(r_k)$ for each s_k. Suppose that a 3-bit image (L=8) of size 4 × 4 pixels (MN = 16) has the intensity distribution shown in following table.	9

r_k (k^{th} intensity value)	0	1	2	3	4	5	6	7
n_k (no. of pixels in an image with intensity r_k)	20	10	25	15	4	8	6	2

	d)	Calculate the chess board and city block distance for the pixels x and y with coordinates (6, 9) & (14, 18) and also show it in the matrix form.	6
3.	**a)**	Explain the edge detection? What is formula of gradient direction and magnitude?	6
	b)	What is the need of image segmentation?	3
	c)	Write down all the masks in point and line detection.	6
	d)	How to measure the image information based on information theory?	5
4.	**a)**	What is opening and closing operations in morphological image processing?	6
	b)	What is HDRI imaging?	3
	c)	Describe the Gaussian noise with formulation.	5
	d)	Describe the noise in color images.	3
	e)	What is Tonal correction?	3
5.	Write short notes on the following (***any four***):		4x5=20
	a)	Topological properties of digital images	
	b)	HSI color model	
	c)	Image Enhancement	
	d)	Image transformation	
	e)	Image denoising	
6.	Differentiate between the following (***any four***):		4x5=20
	a)	Min and Max Filter	
	b)	Airthmetic coding and LZW coding	
	c)	Erosion and Dilation	
	d)	Image smoothing and Image Sharpening	
	e)	Histogram equalization and Histogram matching	