Reg. No. | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATION, MAY 2023

Sixth Semester

EC18008/DIGITAL IMAGE PROCESSING

(Electronics and Communication Engineering)

(Regulation 2018)

TIME: 3 HOURS **MAX. MARKS: 100**

CO 1 Examine the different image enhancement techniques. **2**

CO 2 Identify and interrelate the various image compression techniques. **3**

CO 3 Assess various image transformation techniques and Image analysis. **3**

CO 4 Determine the image segmentation and classification techniques for various applications. **3**

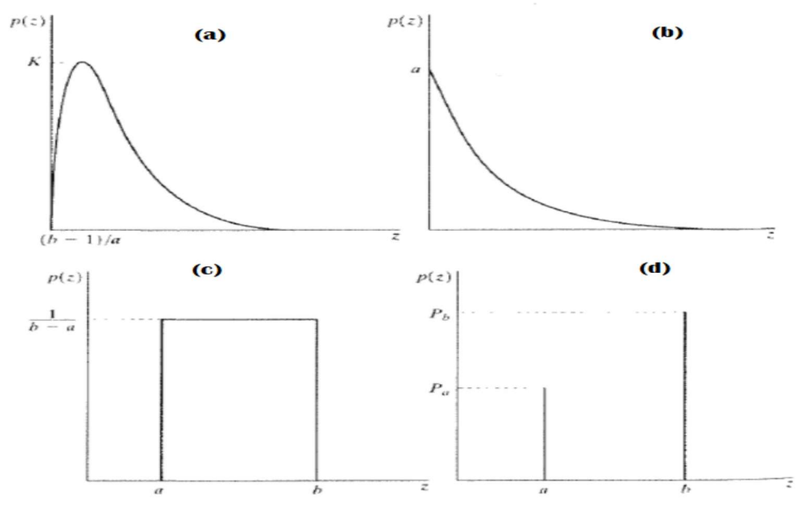
CO 5 Infer the various image processing techniques employed for real time applications. **4**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Consider the following condition wherein a person enters a dark theater on a bright day. It takes an appreciable interval of time before the person can see well enough to find an empty seat. Which of the visual processes is at play in this situation?	**1**	**2**
2.	Compute the Hadamard transform matrix of order 4.	**3**	**3**
3.	Identify and plot the suitable intensity transformation technique for an 8-bit gray scale image so that intensities greater than 108 are mapped to white and lesser than 108 are mapped to black.	**1**	**2**
4.	Match the following:	**1**	**2**

Type of Noise	Type of filter
(i) Noise reduction	(a) 0
(ii) sum of coefficients in a smoothing kernel	(b) High Pass filter
(iii)Edge detection	(c) 1
(iv) sum of coefficients in a sharpening kernel	(d) Low Pass filter

5. 

Identify the type of noise from the noise model and express its functional representation. **4** **3**

6. Median filter is an effective tool to minimize salt and pepper noise. Justify the statement through simple illustration. **4** **3**

7. What are the advantages and disadvantages of Bayesian classifier? **4** **3**

8. Consider a simple Multi-Layer Perceptron network with 2 neurons and inputs are 2, 3. Assume the weights to the input neurons be 3, 4. Let the activation function be a linear constant value of 4. Determine the output of the network. **4** **3**

9. Differentiate lossless and lossy compression techniques. **2** **3**

10. How are Image Processing techniques applied for In-Vehicle Vision Systems? **5** **4**

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	Elaborate the techniques in which a scene of analog image is stored as a digital image. Discuss the effect of decreasing the sampling period and also decreasing the Quantization levels.	**(7)**	**1**	**3**
	(ii)	Compute the Kernel of Discrete Cosine Transform for N=4.	**(7)**	**1**	**3**
		(OR)			
(b)	**(i)**	Elucidate the various devices and techniques available to acquire an image and store it as a digital image.	**(7)**	**1**	**3**

	(ii)	Compute the inverse 2D DFT of the transform coefficients F(k,l) given below: $$F(k,l) = \begin{pmatrix} 64 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$	**(7)**	**1**	**3**
12. (a)	**(i)**	Perform Histogram equalization of the image $$\begin{bmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{bmatrix}$$ Justify your inference of the image before and after Histogram Equalization.	**(7)**	**1**	**2**
	(ii)	Illustrate and explain with suitable diagrams the various color models and the applications of the same.	**(7)**	**3**	**2**
		(OR)			
	(b)	**(i)** Illustrate and explain a technique to enhance the illumination-reflectance parameter to produce an enhanced image.	**(7)**	**1**	**2**
		(ii) Discuss the type of sharpening filter which can detect thin lines in an image.	**(7)**	**3**	**2**
13. (a)	**(i)**	How wiener filter is helpful to reduce the mean square error when image is corrupted by motion blur and additive noise?	**(10)**	**4**	**3**
	(ii)	Explain the process of Dilation and Erosion with an example.	**(4)**	**4**	**3**
		(OR)			
	(b)	**(i)** Explain region splitting and merging technique for image segmentation with a suitable example.	**(7)**	**4**	**3**
		(ii) How can the contours of an image be segmented using the Greedy Snake algorithm?	**(7)**	**4**	**3**
14. (a)	**(i)**	Explain the different layers of Multilayer Feedforward Neural Network with a neat diagram.	**(14)**	**4**	**3**

		(OR)			
(b)	**(i)**	Illustrate and discuss the architecture and typical components of Convolutional Neural Network and examine the application of the same for an image classification task.	**(14)**	**4**	**3**
15. (a)	**(i)**	With a neat block diagram, explain the transform-based image compression schemes and also the different modes in JPEG compression standard.	**(7)**	**2**	**3**
	(ii)	Elucidate the various image processing techniques being applied in the Finger print recognition system.	**(7)**	**5**	**4**
		(OR)			
(b)	**(i)**	Construct the Huffman code for the word "ILLUSION" and compute the efficiency and compression ratio for the same.	**(7)**	**2**	**3**
	(ii)	Demonstrate the application of face recognition in the field of Biometrics.	**(7)**	**5**	**4**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	**CO**	**RBT LEVEL**
16.	Generate a tag using arithmetic coding procedure to transmit the word 'INDIA' where the probability of the symbols is given below:	**(10)**	**2**	**3**

Symbol	Probability
A	0.2
D	0.2
I	0.4
N	0.2

Decode the generated tag to get back the word 'INDIA'.

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