

University of Mumbai

Examinations Summer FH2022

Program: **Electronics and Telecommunication Engineering**

Curriculum Scheme: Rev2019

Examination: TE Semester VI

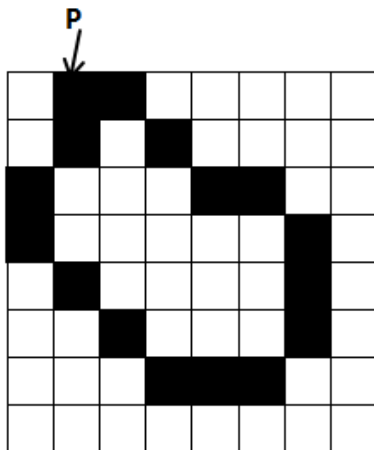
Course Code: ECC603 and Course Name: Image Processing Machine Vision

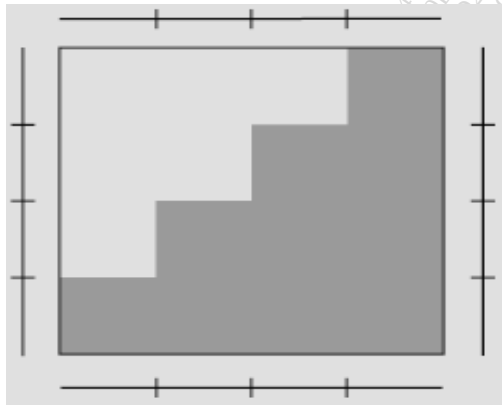
Time: 2 hours 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks. State the option clearly in your answer-book.
1.	Equalized histogram of digital image is always:
Option A:	Almost uniformly distributed over $[0, L-1]$
Option B:	Exactly uniformly distributed over $[0, L-1]$
Option C:	Concentrated in lower side of $[0, L-1]$
Option D:	Concentrated in higher side of $[0, L-1]$
2.	Spatial domain techniques used for a. Using complete dynamic range b. Binarizing a digital image, respectively, are
Option A:	a) Log transformation b) contrast stretching
Option B:	a) Contrast stretching b) thresholding function
Option C:	a) Image negative function b) Log transformation
Option D:	a) Thresholding function b) contrast stretching
3.	If the standard deviation of pixels is positive, then the sub image is labelled as
Option A:	Red
Option B:	White
Option C:	Green
Option D:	Black
4.	Increasing radius of the white circle in the Low Pass filter employed in frequency domain enhancement of digital images, results in
Option A:	More blurred image
Option B:	More sharpened image
Option C:	Clearer image with more details
Option D:	Darker image with thin details
5.	A Support Vector Machine can be best described as
Option A:	A machine learning algorithm used in pattern recognition
Option B:	A pattern recognition algorithm used in object recognition
Option C:	A neural network algorithm used for supervised learning
Option D:	A machine learning algorithm used for classification/regression
6.	The major difference between Image Enhancement and Image Restoration is that
Option A:	Enhancement is an objective process and Restoration is a subjective process
Option B:	Enhancement uses filtering techniques while Restoration uses morphological techniques.
Option C:	Restoration is an objective process and Enhancement is a subjective process
Option D:	Restoration uses filtering techniques while Enhancement uses morphological techniques.

7.	Segmentation is usually not perfect due to number of factors such as
Option A:	Noise and bad illumination
Option B:	object contains several regions
Option C:	boundary-filling
Option D:	closed contour
8.	The method used for point detection is
Option A:	Second derivative
Option B:	First Derivative
Option C:	Third Derivative
Option D:	Fourth Derivative
9.	Which of the following is process of partition the digital image into multiple regions
Option A:	Merging
Option B:	Filling
Option C:	Transform
Option D:	Splitting
10.	Signature of a circle as a shape is
Option A:	a triangular waveform
Option B:	a 45-degree line
Option C:	a square waveform
Option D:	a horizontal line

Q2.	
A	Solve any Two 5 marks each
i.	Explain Unsharp Masking and High-boost Filtering.
ii.	 For the image shown above, find 8-directional chain code and shape number. Consider P as starting point and clockwise direction for the path.

iii.	Show the segmentation of the following image using split-and-merge technique. 																		
B	Solve any One 10 marks each																		
i.	Explain the principle of spatial domain filtering. Perform averaging operation using 3 by 3 mask on the image given below. Use zero padded image for performing averaging operation. <table><tr><td>4</td><td>1</td><td>7</td></tr><tr><td>3</td><td>4</td><td>1</td></tr><tr><td>2</td><td>3</td><td>5</td></tr></table>	4	1	7	3	4	1	2	3	5									
4	1	7																	
3	4	1																	
2	3	5																	
ii.	Obtain equalized histogram for the following distribution. <table><tr><td>Intensity</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>Number of pixels</td><td>70</td><td>40</td><td>100</td><td>40</td><td>10</td><td>70</td><td>10</td><td>60</td></tr></table>	Intensity	0	1	2	3	4	5	6	7	Number of pixels	70	40	100	40	10	70	10	60
Intensity	0	1	2	3	4	5	6	7											
Number of pixels	70	40	100	40	10	70	10	60											
Q3.																			
A	Solve any Two 5 marks each																		
i.	Justify/contradict: Shape numbers are rotation invariant representations of shape contours.																		
ii.	Compare Ideal, Butterworth and Gaussian filtering.																		
iii.	Obtain 2-D DFT of the following digital image. <table><tr><td>3</td><td>1</td><td>2</td><td>2</td></tr><tr><td>1</td><td>3</td><td>2</td><td>2</td></tr><tr><td>2</td><td>1</td><td>4</td><td>3</td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td></tr></table>	3	1	2	2	1	3	2	2	2	1	4	3	1	2	3	4		
3	1	2	2																
1	3	2	2																
2	1	4	3																
1	2	3	4																
	PTO																		

B	Solve any One 10 marks each
i.	Perform opening of the following image with the given structuring element and closing of the complement of the same image with the same structuring element. SE: $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ Image: $f(x,y) = \begin{bmatrix} 1 & 1 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 \end{bmatrix}$
ii.	Illustrate K-means algorithm with a suitable example.
Q4.	
A	Solve any Two 5 marks each
i.	Justify/contradict: A deviation in the position of support vectors does not affect the classification hyperplane.
ii.	Derive Haar transform for N=4.
iii.	State principles of Object Recognition and explain techniques used at each step of object recognition.
B	Solve any One 10 marks each
i.	Draw and explain model of image degradation.
ii.	Explain Canny edge detection algorithm in detail with proper schematics.
END OF QUESTION PAPER	