

# 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

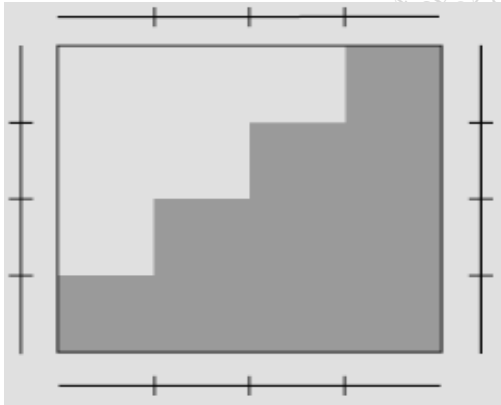
Time: 2 hours 30 minutes

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

<b>Q2.</b>	
<b>A</b>	<b>Solve any Two</b> <span style="float: right;"><b>5 marks each</b></span>
i.	Explain Unsharp Masking and High-boost Filtering.
ii.	<div style="text-align: center;"> </div> <p>For the image shown above, find 8-directional chain code and shape number. Consider P as starting point and clockwise direction for the path.</p>

iii.	<p>Show the segmentation of the following image using split-and-merge technique.</p> 																		
<b>B</b>	<p><b>Solve any One</b> <span style="float: right;"><b>10 marks each</b></span></p>																		
i.	<p>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.</p> <table border="1" data-bbox="790 913 992 1077" style="margin-left: auto; margin-right: auto;"> <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.	<p>Obtain equalized histogram for the following distribution.</p> <table border="1" data-bbox="379 1167 1305 1272" style="margin-left: auto; margin-right: auto;"> <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
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Number of pixels	70	40	100	40	10	70	10	60											
<b>Q3.</b>																			
<b>A</b>	<p><b>Solve any Two</b> <span style="float: right;"><b>5 marks each</b></span></p>																		
i.	<p>Justify/contradict: Shape numbers are rotation invariant representations of shape contours.</p>																		
ii.	<p>Compare Ideal, Butterworth and Gaussian filtering.</p>																		
iii.	<p>Obtain 2-D DFT of the following digital image.</p> <table border="1" data-bbox="986 1574 1299 1731" style="margin-left: auto; margin-right: auto;"> <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																
<b>PTO</b>																			



B	<b>Solve any One</b>	<b>10 marks each</b>
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.	
<b>Q4.</b>		
A	<b>Solve any Two</b>	<b>5 marks each</b>
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	<b>Solve any One</b>	<b>10 marks each</b>
i.	Draw and explain model of image degradation.	
ii.	Explain Canny edge detection algorithm in detail with proper schematics.	
<b>END OF QUESTION PAPER</b>		