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

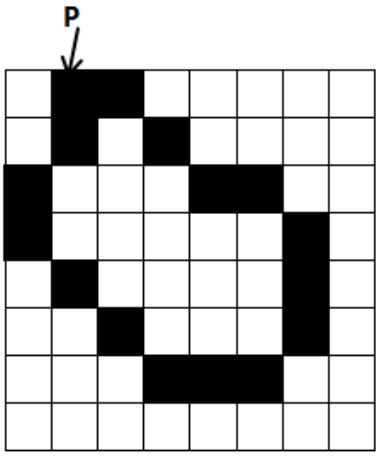
Time: 2 hours 30 minutes Max. Marks: 80

==========

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.

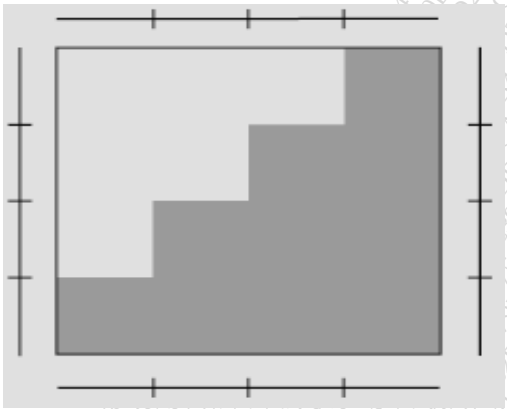
7873162B79775C39DDCAB40D2CC5EF4C

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.

7873162B79775C39DDCAB40D2CC5EF4C

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.

4	**1**	**7**
3	**4**	**1**
2	**3**	**5**

ii. Obtain equalized histogram for the following distribution.

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.

3	**1**	**2**	**2**
1	**3**	**2**	**2**
2	**1**	**4**	**3**
1	**2**	**3**	**4**

PTO

7873162B79775C39DDCAB40D2CC5EF4C

B	**Solve any One** **10 marks each**
i.	Perform opening of the following image with the given structuring element and closing of the compliment of the same image with the same structuring element. SE: Image: $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ $f(x,y) = \begin{bmatrix} 1 & 1 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 \end{bmatrix}$
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

7873162B79775C39DDCAB40D2CC5EF4C