Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

VI SEMESTER B.TECH. (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, JUNE 2018

SUBJECT: MACHINE VISION AND IMAGE PROCESSING [MTE 4006]

(/06/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **All** the questions.
- Data not provided may be suitably assumed with justification.

1A. Intensity distribution table of a 2 bit image of size 8x8 is given below in Fig.Q1A. Perform histogram equalization on this image and find the pixels in equalized image. Draw histogram plot of the image with and without equalization. **04**

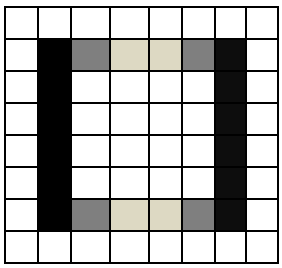

Fig.Q1A

1B. Describe Global edge linking technique using Hough transform. **04**

1C. An 8 bit image shown in Fig.Q1C (i), was corrupted by motion blur and additive noise and looks as shown in Fig.Q1C (ii). This blurred image is passed through direct inverse filter and the resultant image is shown in Fig.Q1C (iii). Identify and explain the reason for poor result in Fig. Q1C(iii). **02**

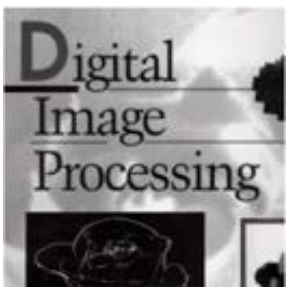

Fig.Q1C(i)

Fig.Q1C(ii)

Fig.Q1C(iii)

2A. Describe the various frequency domain filters used for image sharpening. **04**

2B. A set of image pair is given in Fig. Q2B (i) and Fig. Q2B(ii). Suggest and explain a spatial domain image enhancement technique that can be used to get an expected image from the given image. **03**

Fig.Q2B(i)

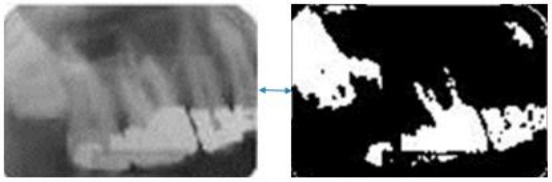

Fig.Q2B(ii)

2C. Identify and describe the morphological operations to be performed for the following scenario: **03**
(i) A paragraph given in Fig.Q2C (i) has to be processed by a digital computer. But due to gaps computer is unable to consider each letter as a whole character.
(ii) Due to improper camera setting the two objects (square and circle) appear to be a single object as shown in Fig.Q2C (ii) But for further processing it is necessary to separate these two objects as in Fig. Q2C(iii)

Fig.Q2C (i)

Fig.Q2C (ii)

Fig. Q2C(iii)

3A. A point in world plane is captured by two identical cameras placed on right and left side. Derive the expression for the fundamental matrix for relation two corresponding views. Also explain when it is best used. **04**

3B. Describe the goal of stereo vision. What is the principle behind stereo vision. **03**

3C. An image taken from a camera has undergone a radial distortion as shown in the Fig. Q3C (i). The scene is supposed look as shown in Fig.Q3C (ii). Define radial distortion and discuss the reason for this radially distorted image and suggest how the distortion from Fig. Q3C (i) can be removed to get image in Fig Q3C(ii). **03**

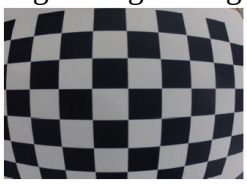

Fig.Q3C(i)

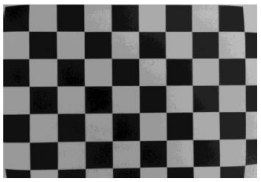

Fig.Q3C(ii)

4A. A professor of archeology doing research on currency exchange practices during the Roman Empire recently became aware that four Roman coins are listed in the holdings of British Museum in London. Unfortunately, he was told after arriving there that the coins recently had been stolen but the museum keeps photographs of every item for which it is responsible. Unfortunately, the photos of these coins are blurred to the point where the date and other small markings are not readable. The cause of the blurring was the camera being out of focus when the images were taken. As an image processing expert you are asked to restore the blurred images so that professor can read the markings. You are told that the original camera used to take photos is still available, as are the other representative coins of the same era. Propose a step by step solution to obtain the degradation model of the blurred images. **04**

4B. Differentiate image enhancement and Restoration techniques. Demonstrate image degradation model. **03**

4C. With the help of mathematical expression discuss ideal low pass filter. When an image is filtered with ideal low pass filter, ringing effect occurs. Describe the reason for this and suggest how this can be reduced. **03**

5A. Assume that you are given a job to automate the process of detecting the vehicles passing on a given road. Its background is known and all trackable objects look different from the background. Identify the object tracking technique that you should apply and describe the same. **04**

5B. Elucidate the terms connectivity and m-adjacency. Consider the image segment shown in Fig.Q5B. Let V= {1,2}, compute the lengths of the shortest 4,8,m path between p and q. If a particular path does not exist between these two points explain the reason for the same. **03**

4	2	3	$2(q)$
3	3	1	3
2	3	2	2
$(p)2$	1	2	3

Fig.Q5B

5C. Identify the noise present in Fig.Q5C. With graphical representation and probability density function (PDF) describe this noise. Propose an image enhancement technique to remove noise present in the image shown in Fig.Q5C and justify your answer. **03**

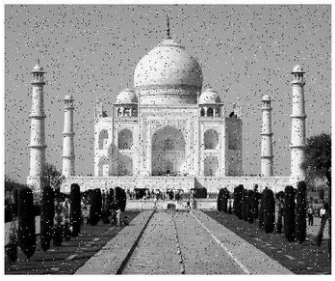

Fig.Q5C