Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
APRIL/MAY 2018
SUBJECT: COMPUTER VISION (ECE - 4038)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Differentiate between point and area sources. Give an example of each. With the help of a suitable diagram, derive the perspective projection equation. State the projection equation for affine projection model.

1B. Define normalized histogram of an image. Compute the normalized histogram of the 8-bit grayscale image shown in Figure 1B. Describe its relationship with probability distribution function.

1C. Define textons. List three kinds of texture representations.

(5+3+2)

2A. With the help of a suitable example, explain the non-maximum suppression and hysteresis thresholding algorithm. Explain a scenario where you would use these two algorithms.

2B. Describe in detail an algorithm to compute scale invariant interest points using LoG.

2C. Define a gray scale co-occurrence matrix used for texture representation. Given the 2-bit image shown in Figure 2C, calculate the gray scale co-occurrence matrices: C(1,0), C(1,1)

(5+3+2)

3A. Define shot in a video. Describe four different methods for shot boundary detection using interframe distance.

3B. In the topographical interpretation of the image used in watershed segmentation, list the three different types of points present in the image. Identify the points computed using the watershed segmentation

3C. Assuming image segmentation as a missing data problem, state the probability of generating the pixel vector. Also, Identify the unknown parameters

(5+3+2)

4A. Given the observed data x_i,y_i, i = 1,..N, we wish to use least square approach of fitting the line. State the error function that is minimized to obtain the parameters of the line. Consequently, derive the expression for the unknowns a, b in terms of x_i,y_i. State one shortcoming of this approach.

4B. Given two image pair of a scene, describe the process of computing the rectified images. Discuss the advantages of using the rectified image pair in the 3D reconstruction of the scene.

4C. State the intrinsic and extrinsic parameters of the camera.

(5+3+2)

5A. Assume that *L(i->j)* is the loss incurred when an object of class *i* is classified as having class *j*. For a

two-class classifier with class 1 and class 2, show that the we select class 1 if

$p(1|x)L(1->2) > p(2 \mid x) L(2 ->1)$

where $p(k|x)$ is the posterior probability of class k given feature vector x. Describe the multi-class Bayes classifier that minimizes total risk.

5B. Describe the algorithm for a $(k,0)$ nearest neighbour classification. List at least one challenge in building this classifier.

5C. Describe hard negative mining and bootstrapping used in classification.

(5+3+2)

20	20	20	0	0	0
20	20	20	255	255	255
30	30	30	30	30	30
40	40	40	40	40	40
50	50	50	50	50	50
60	60	60	60	60	60

Figure 1B

0	0	1	1
0	0	1	1
2	2	0	0
2	2	0	0

Figure 2C