Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (INFORMATION TECHNOLOGY / COMPUTER AND COMMUNICATION ENGINEERING)

MAKE UP EXAMINATIONS, DECEMBER 2018

SUBJECT: PROGRAM ELECTIVE -IV COMPUTER VISION [ICT 4018]

REVISED CREDIT SYSTEM

(29 /12 /2018)

Time: 3 Hours (Scheme of Evaluation) MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data, if any, may be suitably assumed.

1A. Prove separability of Laplacian of Gaussian: Two dimensional LoG can be separated into 4 one-dimensional convolutions. 5

1B. Explain key properties of linear filters with respect to linearity and shift invariance. 3

1C. For each of the following properties, say whether it is Affine invariant or not and support your answer with examples or counter examples: 2

i) Lengths
ii) Parallelism
iii) Angles
iv) Midpoints

2A. Explain Marr Hildreth edge detection algorithm. 5

2B. Define the following terms: 3

i) Auto-correlation
ii) Covariance
iii) Precision and Recall

2C. Derive the relation between correlation and sum of squared difference(SSD). 2

3A. Define perspective projection. Prove the following perspective phenomenon: 5

i) Parallel lines converge to a vanishing point.
ii) Nearer objects are lower in the image.
iii) Nearer objects look bigger.

Scheme written by:

1A, 1B, 1C, 2A, 2B, 2C, 3A — AG

3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C — UBAP

3B. Gradient orientation and magnitude using HOG feature extraction is given in Figure Q.3B. Quantize the gradient orientation into 9 bins (0-180).

0	64	90	73
78	27	169	166
102	163	152	176
159	22	125	143

Gradient Direction

3	4	2	2
7	9	3	4
22	17	4	6
85	32	26	2

Gradient Magnitude

Figure Q.3B

3C. Explain Lucas Kanade method for determing the optical flow. 3 2

4A. Using RANSAC method fit the following data points:
(5, 11), (150, 500), (50, 200), (7, 15), (40, 84), (23, 47), (3, 7), (100, 201), (10, 22), (15, 100)
Note that threshold is equal to 4 and number of inliers should be 7. 5

4B. What is region based segmentation? Explain the method of region merging and splitting used for region based segmentation. 3

4C. What is an essential matrix? How it is related to fundamental matrix? 2

5A. Using principal component analysis reduce the dimensionality of data given below:

2.5	2.4
0.5	0.7
2.2	2.9
1.9	2.2
3.1	3.0
2.3	2.7
2	1.6

5

5B. Write Hough transform algorithm for fitting a straight line. 3

5C. What is the relationship between face image and Eigen face images of a person? 2