

A Constituent Institution of Manipal University

MANIPAL INSTITUTE OF TECHNOLOGY

II SEMESTER M.TECH (INDUSTRIAL AUTOMATION AND ROBOTICS) END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: MACHINE VISION AND IMAGE PROCESSING [MTE 5136]

REVISED CREDIT SYSTEM

(27/04/2017)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ANY FIVE FULL questions.
- ✤ Missing data may be suitable assumed.
- A brain MRI is shown in Fig.Q1A (a). Results of filtering with Butterworth Low Pass Filter of order 2, with cutoff frequencies at different radii shown in Fig. Q1A (b) and Fig. Q1A (c). Analyze these images and identify which image among Fig. Q1A (b) and Fig. Q1A(c) has used a filter with larger radius. Justify your answer.



- 1B Explain the reason behind selecting Butterworth low pass filter over ideal low pass 2 filter and Gaussian low pass filter.
- 1C The output of most sensors is a continuous voltage waveform whose amplitude and spatial behavior are related to the physical phenomenon being sensed. Describe the two processes involved in the conversion of continuous sensed data into digital form.
- 2A Recognize an object tracking technique to track the '+' points show in the Fig. Q2A.
 5 The technique you proposed should be able to predict the object's future location and correct the noise introduced by inaccurate detections.



Fig. Q2A

2B Equalize the histogram of a 8 X 8 image with values given in table below. The image has grey levels from 0 to 7. Draw histograms with and without equalization.

Input Grey level	0	1	2	3	4	5	6	7
n _k	0	0	0	8	14	5	0	0

- 2C In general, the discrete histogram equalization technique does not yield a flat 2 histogram. Explain the reason behind it.
- 3A Describe the process of extracting 3-D information from multiple 2-D views of a scene. Propose an algorithm for estimating the depth of the objects for aiding Robot navigation.
- 3B Document classification or document categorization is a problem in library science, information science and computer science. The task is to assign a document to one or more classes or categories. This can be done algorithmically. Recognize an appropriate document classification technique and explain the steps involved in it.
- **4A** Describe imaging transformation for projecting a 3D world point into the image plane.
- 4B A camera lens has a focal length of 10. Find out the image point corresponding to a world point at a location (50, 70, 100). Assume image coordinate system and world coordinate system are perfectly aligned.
- 4C Analyze the image shown in the Fig. Q4C (a) and identify the morphological operations performed in the image for obtaining the image shown in Fig.Q4C (b). Justify your answer by describing the basic morphological operations: dilation, erosion, opening and closing.



5A Analyze the image shown the Fig.Q5A and determine the noise present in the image.2 Comment on the unipolar and bipolar behavior of the noise present in the image shown in the figure.



Fig. Q5A

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- **5B** Identify a filter for removing the noise present in the image shown in Fig. Q5A and 2 justify your answer.
- 5C An aerial image of an airport is shown in Fig. Q5C. The objective is to identify the two edges of principal runway. Analyze the image and Determine the key stage of image processing technique which helps to identify the runway for autonomous navigation of air vehicles. Also describe the global edge linking technique which helps to see the runway properly.



Fig. Q1C

- 6A A photograph's exposure determines how light or dark an image will appear when it is being captured by the camera. List and illustrate the camera parameters which determine the exposure.
- 6B Explain role of image transformation in image compession. Describe the transform4 used in JPEG to convert image from time domain to spatial domain.