Enrolment No.

Seat No.:

## **GUJARAT TECHNOLOGICAL UNIVERSITY BE – SEMESTER VIII– • EXAMINATION – SUMMER 2015**

# Subject Code: 182006 **Subject Name: Machine Vision** Time: 10.30am-01.00pm

### Date: 05/05/2015

**Total Marks: 70** 

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary and clearly mention the same.
- 3. Figures to the right indicate full marks.
- 4. Draw neat diagrams. Diagrams with inferior quality may not be awarded credit.
- **Q.1** (a) Schematically represent the following transfer functions and briefly 7 describe their practical functionality.
  - 1. Piece wise linear interpolation
  - 2. Thresholding
  - 3. Gray level slicing
  - (b) Bring out the importance of sampling, quantization and iso-preference 7 curve to control the quality of a digital image with suitable examples.
- 0.2 (a) Explain the working of adaptive median filter by writing the logic of its 7 programming implementation. How does the adaptive median filter differ from regular median filter?
  - (b) Justify the following statements. Short and CRISP answer will be 7 appreciated.
    - 1. Alpha trimmed mean filters are useful in the situations involving multiple types of noise.
    - 2. Two dimensional discrete Fourier transform can be computed by successive computations of two one dimensional discrete Fourier transform one after the other.

#### OR

- (b) Explain: "The only way to obtain a perfectly filtered image in spatial 7 domain is to accept somewhat smaller filtered image by limiting the excursion of the center of the filter mask to a distance no less than a specific number of pixels from the border of original image."
- (a) Using the properties of impulse function and convolution theorem prove 7 0.3 that the filter in spatial and frequency domain constitutes a Fourier transform pair.
  - (b) Explain the procedure to get a sharpened image using Laplacian filter in 7 frequency domain. Derive Laplacian filter in frequency domain to support your answer.

- Q.3 (a) Briefly describe the following properties of two dimensional Fourier 7 transform.
  Translation, Distributivity, Rotation
  - (b) Explain the working of following filters used in image restoration process. 7
    - 1. Geometric mean filter
    - 2. Contra-harmonic filter
    - 3. Mid-point filter
- Q.4 (a) What is histogram of a digital image? Show that the histogram matching is 7 the extension of histogram equalization with mathematical formulation.
  - (b) Describe various methods of zooming and shrinking for enlargement or 7 reduction of the given image to different sizes.

#### OR

- Q.4 (a) Explain the principle of homomorphic filtering process with the help of 7 mathematical development, block diagram and filter development.
  - (b) Show that the butter worth low pass filter is viewed as a transition between 7 ideal and Gaussian low pass filter. Characterize these all filters for the amount of blurring and ringing they produce with the decrease of their cut off frequency.
- Q.5 (a) Describe the bit plane slicing of digital image and bring out the importance 7 of the process.
  - (b) Explain the working of a morphological process, which can be utilized for 7 bridging the gap of broken characters in case of character recognition by machine perception.

#### OR

- Q.5 (a) Evaluate the following statements.
  - 1. Smaller objects become solid white when the sharpening is poor.
  - 2. A major use of averaging filters is in the reduction of irrelevant details in the image.
  - (b) Explain the sequence of morphological operators to be applied on a binary 7 image of finger print degraded by salt and pepper noise for making it noise free.

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