Reg. No.



SEVENTH SEMESTER BTECH. (E & C) DEGREE END SEMESTER EXAMINATION JANUARY 2020 SUBJECT: DIGITAL IMAGE PROCESSING (ECE - 4006)

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.
- 1A. Explain how first and second order derivatives is used for spatial image enhancement with a suitable example.
- 1B. Show that the subtracting the Laplacian from an image is proportional to unsharp masking
- 1C. Explain the concept of sampling and quantization of an image. Explain how the images are represented digitally

(4+3+3)

- 2A. Explain 4,8 and m-adjacency with a suitable example
- 2B. What is point processing? Explain any two point processing technique with proper example.
- 2C. Explain the convolution property in 2D Fourier transform.

(4+3+3)

- 3A. Consider a 3X3 spatial mask that averages the four closest neighbours of a point (x,y), but excludes the point itself from the average, find the equivalent filter H(u,v) in the frequency domain. Show that the result is a low pass filter.
- 3B. Explain the process of image restoration. Explain any two important noise probability density function.
- 3C. Mention Roberts and Prewitt Operator.

(4+3+3)

- 4A. Given a four symbol source {a b c d} with source probabilities {0.1 0.4 0.3 0.2} arithmetically encode the sequence bbadc.
- 4B. Explain 2D DFT with its four properties and explain how the 2D filtering can be done in frequency domain
- 4C. Explain Optimal Global and Adaptive thresholding. Obtain the analytical expression for T by assuming p1 (z) and p2 (z) as Gaussian distribution function. If $\mu 1 = 110 \sigma 1 = 15$ and $\mu 2 = 200$, $\sigma 2 = 40$, Propose a thresholding solution for segmenting the objects out of the image. (Background pixel is more compared to object pixel).

(4+3+3)

- 5A. What are the typical components of a digital image processing system and application?
- 5B. Write the expression for transfer function of Gaussian and Butterworth low pass and high pass filters

- 5C. Explain the following morphological operator with suitable example.
 - a. Erosion b. Dilation

(4+3+3)