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B.C.A.**FIFTH SEMESTER EXAMINATION, 2019-20****IMAGE PROCESSING**Time : **3 Hours**Max. Marks : **60**

Note : (i) Attempt **ALL** questions.
(ii) Choices are given in each question set.

1. Attempt any **Four** of the following questions: **3 x 4 =**

12

- (a) How can a digital image be generated? Explain on the basis of image acquisition system.
- (b) What does the image histogram represent? Explain.
- (c) What is the range of pixel values in an 8-bit digital image? Write down the formula to normalize the pixel values in the range [0, 1].
- (d) How does quantization work on a digital image? Explain for a gray scale image.
- (e) Define a digital image by using a mathematical function. How the image coordinates are read in the image? Generalize the concept of coordinate system for multiband images.
- (f) Find out the negative of the following 4 x 4 image which is represented by the bit depth of 4-bit.

2. Attempt any **Four** of the following questions: **3 x 4 =**

12

- (a) Explain the algorithm for histogram equalization. What is the

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- (b) What is a smoothing filter? Write down the mask for basic smoothing filter.
- (c) Usually a mask of odd size is considered for filtering in spatial domain. What is the significance of odd size mask? Can a mask of even size be used? Justify the answer.
- (d) How can the brightness of an image be enhanced? Write down the procedure for a gray scale image.
- (e) Write down the Canny operator for sharpening the image. What is the characteristic of Canny operator?

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4. Attempt any **Two** of the following questions:

6 x 2 =

12

- (a) Explain the term Noise. How is the Gaussian noise different from the salt and pepper noise? Explain by writing the noise models for both. Why is the noise an inevitable part of the digital images?
- (b) Consider following 4 x 4 image matrix. Plot the histogram of the images. Apply Gaussian noise to the given image and again plot the histogram. What is the effect of Gaussian

(f) What is Laplacian of Gaussian (LoG) filter? Derive the formula for LoG filter.

3. Attempt any **Two** of the following questions: **6 x 2 = 12**

(a) Answer the following:

(i) How can smoothing be done in frequency domain? Explain with proper mathematical notations.

(ii) What does the term frequency represent in frequency domain? What is the restriction on image size while processing the digital images in frequency domain.

(b) What is the Fourier transform? How can a discrete Fourier transform be applied on digital images? Explain.

(c) Answer the following:

(i) Differentiate the low pass filters and high pass filters.

(ii) Is it possible to apply the same filter in frequency domain which is available in spatial domain? Strengthen your explanation with appropriate mathematical formulation.

noise on the histogram of the image? Explain on the basis of the formulation of the noise.

(c) Answer the following:

(i) How singular value decomposition is useful in image restoration process?

(ii) What is blind image restoration? Explain with the help of one example.

5. Attempt any **Two** of the following questions: **6 x 2 = 12**

(a) What are the various color models used in digital image processing? Write down the formula to convert HSI model into RGB model. What is the need of different color models?

(b) Write down the algorithm to extract the boundary of a given object in a digital image. Consider the face detection in an image and explain how the face boundary can be detected.

(c) Answer the following:

(i) How can a color image be used for edge detection?

(ii) Are dilation and erosion operations independent of each other? Explain on the basis of their processing.