Student Exam No: _____

GANPAT UNIVERSITY
M. TECH SEM. II COMPUTER ENGINEERING
REGULAR EXAMINATION MAY/JUNE: 2012
3CE201: Digital Image Processing

Time: 3 Hours] **[Total Marks: 70**

Instructions: 1. Figures to the right indicate full marks of the question.
2. All questions are compulsory.
3. Each section should be written in a separate answer book.

SECTION: I

Q:1 (a) Discuss Sampling and quantization process for creating digital image in brief. [4]

(b) A ccd camera chip of 7 x 7 mm, and having 2048 x 2048 elements focused on a square, flat area, located 0.5 m away. How many line pairs per mm will this camera be able to resolve? The camera is equipped with 35 mm lens. [4]

(c) Explain why the discrete histogram equalization technique does not yield a flat histogram. [4]

OR

Q:1 (a) Propose the method for updating the local histogram for use in local enhancement technique. [4]

(b) Define histogram and explain dark, bright, low contrast, high contrast image in respect of their histograms. [4]

(c) Explain applications of images in ultraviolet, X-ray and Infrared band. [4]

Q:2 (a) Discuss various gradient operators and its usage [4]

(b) Show that the Laplacian of a continuous function f(t, z) of variables t and z satisfies the following Fourier transform pair [4]

$$\nabla^2 f(t,z) \Leftrightarrow -4\pi^2(\mu^2 + v^2)F(\mu, v)$$

(c) Discuss average filters. [3]

OR

Q:2 (a) Can you think of way to use the Fourier transform to compute the magnitude of the gradient for use in image differentiation? Justify your answer. [6]

(b) Elaborate the relationship between filtering in spatial and frequency domain. [5]

Q:3 (a) Consider a 3x3 spatial mask that averages the four closest neighbors of a point (x, y), but excludes itself from the average. [6]
(i) find the equivalent filter, H(u, v) in the frequency domain
(ii) Show that your result is low pass filter

(b) Perform histogram equalization on following 8x8 image distribution. Also comment on your answer. [6]

Gray Level	0	1	2	3	4	5	6	7
No of pixels	8	8	8	8	8	8	8	8

SECTION: II

Q:4 (a) Prove the following. [6]

(i) $A \circ B$ is a subset of A

(ii) If C is a subset of D, then $C \circ B$ is a subset of $D \circ B$

(iii) $(A \circ B) \circ B = A \circ B$

(b) Briefly explain H.261 compression standard [6]

OR

Q:4 (a) Discuss what would you expect the result in each case. [4]

(i) The starting point of hole filling algorithm is a point on the boundary of an object.

(ii) The starting point in the hole filling algorithm is outside the boundary.

(b) Prove that opening and closing are dual of each other. [2]

(c) Write brief short note on Digital water marking [6]

Q:5 (a) Explain what would happen in binary erosion and dilation if the structuring element is a single point, valued 1. Justify your answer. [4]

(b) Give a set of 3x3 masks that can be used to detect 1 Pixel breaks in horizontal, vertical, at 45° and at -45°. Assume that intensities of the lines and background are 1 and -1. [4]

(c) Briefly explain Region growing algorithm. [3]

OR

Q:5 (a) Discuss watershed segmentation algorithm. [5]

(b) Explain canny edge detection algorithm in detail. [6]

Q:6 (a) Discuss optimum global thresholding for multiple thresholds. [6]

(b) Describe Hough transformation for edge linking. State its advantages. [6]

----------**End of Paper**----------