

**GANPAT UNIVERSITY**  
**M. Tech semester II (Information Technology)**  
**Regular Examination | April - June 2015**  
**3IT201: DIGITAL IMAGE PROCESSING**

Total Time: 3 hours

Total Marks: 60

- Instructions:** 1. Write each section in separate answer sheet.  
 2. Figure to the right indicates full marks.  
 3. Assume suitable data wherever necessary.

**SECTION – I**

- Q – 1 (a)** Differentiate between followings: [2]  
 I. Radiance v/s Luminance  
 II. Monochromatic light v/s Chromatic light
- (b)** Explain image sampling and quantization process. [4]
- (c)** Discuss the image degradation / restoration process model. [4]

**OR**

- Q – 1 (a)** Describe image averaging [3]
- (b)** What is image interpolation? Differentiate between bilinear and bi-cubic interpolation. [3]
- (c)** Explain the probability density functions for following types of noise: [4]  
 I. Gaussian noise  
 II. Erlang noise
- Q – 2 (a)** Extract the connected components from the image given in fig. (A) using morphological operation. 'S' indicates the starting point for the procedure. [5]
- (b)** Draw the necessary structuring elements to detect the end points of horizontal line, vertical line and line with 45° angle for hit-or-miss transformation. [3]
- (c)** Prove that erosion and dilation operations are dual to each other. [2]

**OR**

- Q – 2 (a)** Derive the skeleton for the image shown in fig.(B) on page 2. [6]
- (b)** What is pruning? Discuss any one example of pruning. [4]
- Q – 3 (a)** Discuss the low level, mid level and high level processing in the context of image processing. [3]
- (b)** Find the shortest 8-path and m-path between P and Q in the image given in fig. (C) on page 2. Let  $V=\{0,1,2\}$ . [4]
- (c)** Discuss Median, Max and Min filters [3]



SECTION – II

Q – 4 (a) Consider the histogram values given below, for the 60 x 45, 3-bit image: [6]

$r_k$	0	1	2	3	4	5	6	7
$n_k$	203	256	524	229	545	312	499	132

For the above image, achieve following histogram specification.

$z_q$	0	1	2	3	4	5	6	7
$p_z(z_q)$	0	0	0	0	0.16	0.33	0.27	0.24

(b) Explain the basic steps for applying filters in frequency domain. [4]

OR

Q – 4 (a) Derive all possible Laplacian masks. Also discuss the un-sharp masking and high-boost filtering. [6]

(b) What is ringing effect? What is the cause of ringing effect? [4]

Q – 5 (a) Discuss how image compression can be achieved using bit plane slicing. [4]

(b) Just derive the Laplacian-of-Gaussian filter. [3]

(c) How to determine the maximum value of between-class variance in Otsu's algorithm? [3]

OR

Q – 5 (a) Explain log transformation and power-law transformation to enhance the image. [4]

(b) Discuss the watershed transformation algorithm. [6]

Q – 6 (a) Discuss the following first order derivative filters: [3]

I. Robert's cross gradient    II. Prewitt operator    III. Sobel operator

(b) Explain the Ideal and Butterworth high pass filters. [4]

(c) What is non-maxima suppression? How it can be performed? [3]

----- X -----

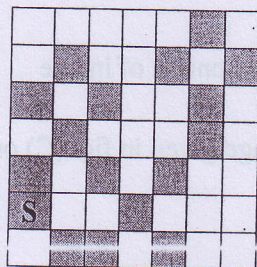


Fig. (A)

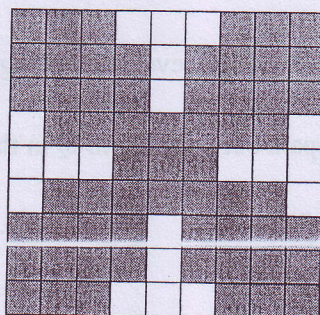


Fig. (B)

	1	0	4	0	1	(Q)
	7	3	0	2	3	
	0	1	2	1	7	
	2	3	1	6	2	
(P)	1	0	5	1	0	

Fig. (C)

END OF PAPER