

INDIAN STATISTICAL INSTITUTE

(Pattern Recognition)

END-SEMESTER EXAMINATION

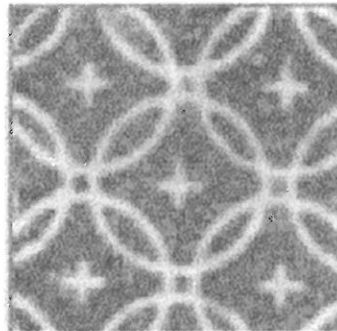
(MS-QR, SQC)

Date: 23-04-2015
Maximum Marks: 56

Duration: 180 minutes

Note: Answer any SEVEN

1. Define erosion and dilation operators. When is a dilation operator? [4+4]
2. Solve
 - a. Show that an opening is dual to closing operator. [4]
 - b. Show that opening is an idempotent operator [4]
3. Explain the results obtained with an area-opening operator for the following figure. [8]



4. Trace the steps of the Vincent-Soille watershed algorithm for the image in the following figure. [8]

| | | | | | | |
|----|----|----|----|----|----|----|
| 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2 | 2 | 30 | 30 | 30 | 2 | 2 |
| 2 | 30 | 20 | 20 | 20 | 30 | 2 |
| 40 | 40 | 20 | 20 | 20 | 40 | 40 |
| 1 | 40 | 20 | 20 | 20 | 40 | 0 |
| 1 | 1 | 40 | 20 | 40 | 0 | 0 |
| 1 | 1 | 1 | 20 | 0 | 0 | 0 |

5. Describe the canny edge detection method for gray level image. [8]

6. Let $\bar{X}^t = (X_1, X_2, X_3, X_4)$ be a random vector with variance-covariance matrix

$$\Sigma = \begin{pmatrix} 3 & 1 & 0 & 0 \\ 1 & 3 & 0 & 0 \\ 0 & 0 & 4 & -1 \\ 0 & 0 & -1 & 4 \end{pmatrix}, \text{ find TWO principal component of } \bar{X} \quad [8]$$

7. State and derive the back error propagation algorithm for multi-layer perceptron. [8]

8. Describe the Branch and Bound Feature selection method with an example of selecting TWO optimum features out of SIX features. [8]