

Day : Monday

Time : 10.00 A.M. TO 1.00 P.M.

Date : 18/12/2017

W-2017-4416

Max. Marks : 80

N.B.:

- 1) Attempt **ANY FIVE** questions from Section – I and **ANY TWO** questions from Section – II.
- 2) Answers to both the sections should be written in **SEPARATE** answer books.
- 3) Figures to the right indicate **FULL** marks.

SECTION – I

Q.1 a) Construct the Truth Table for the following : [05]

$$(p \wedge q) \rightarrow (p \vee q)$$

b) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology. [05]

Q.2 a) Prove that $A \cap (B - C) = (A \cap B) - (A \cap C)$. [05]

b) By mathematical induction method show that [05]

$$\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \dots + \frac{1}{(3n-1)(3n+1)} = \frac{n}{3n+1}$$

Q.3 If Q is the set of all rational numbers and $f: Q \rightarrow Q$ is a mapping, defined by $f(x) = 2x + 3, \forall x \in Q$ then prove that f is one – one and onto. Find f^{-1} . [10]

Q.4 Let R be the relation represented by the matrix $M_R = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$. [10]

Find the matrices that represents: **i)** R^2 **ii)** R^3 **iii)** R^4 .

Q.5 a) Consider the completely parenthesized algebraic expression $(a - b) \times (c + (d + e))$. Find its preorder, postorder and inorder search. [05]

b) Explain Heap Sort with example. [05]

Q.6 If R is a relation on the set of integers I , defined by the set $\{x - y \text{ is divisible by } 7\}$ i.e., $R = \{(x, y), x \in I, y \in I, (x - y) \text{ is divisible by } 7\}$. Then prove that R is an equivalence relation. [10]

Q.7 Write short notes on: [10]

- a)** Automatic theorem proving
- b)** Application of regular language

SECTION – II

Q.8 Describe Warshall's algorithm with example. [15]

Q.9 a) Explain Disjunctive Normal Form and Conjunctive Normal Form. [07]

b) Explain graph coloring in detail. [08]

Q.10 Write an algorithm for Huffman coding and use it to encode the following symbols with frequencies listed: [15]

A: 0.08 B: 0.10 C: 0.12 D: 0.15 E: 0.020 F: 0.35

where is the average number of bits used to encode a character?