Code: 15A05302

**R15**

B.Tech II Year I Semester (R15) Supplementary Examinations June 2017

# DISCRETE MATHEMATICS

(Common to CSE & IT)

Time: 3 hours Max. Marks: 70

## PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What is conjunction? Construct the truth table.

(b) Show that the formula $Q \cup (P \cap \sim Q) \cup (\sim P \cap Q)$ is a tautology.

(c) Define functions.

(d) Let $\lfloor \sqrt{x} \rfloor$ be the greatest integer $\leq \sqrt{x}$. Show that $\lfloor \sqrt{x} \rfloor$ is a primitive recursive.

(e) Prove that the minimum weight of the nonzero code words in a group code is equal to its minimum distance.

(f) Prove that Boolean intensity $(a \cap b) \cup (a \cap b') = a$.

(g) Define planar graph.

(h) Mention the importance of graph coloring.

(i) Prove that a tree with $n -$ vertices has precisely $n - 1$ edges.

(j) A label identifier for a computer program consists of one letter followed by three digits. If repetitions are allowed, how many distinct label identifiers are possible.

## PART – B

(Answer all five units, 5 X 10 = 50 Marks)

### UNIT – I

2 (a) Construct the truth table for $(P \vee Q) \vee \sim P$.

(b) Demonstrate that R is a valid inference from the premises $P \rightarrow Q, Q \rightarrow R$ and $P$.

**OR**

3 Obtain the principal disjunctive normal form of:

(a) $\sim P \vee Q$.

(b) $(P \cap Q) \vee (\sim P \cap R) \vee (Q \cap R)$.

### UNIT – II

4 (a) Let Z be the set of integers and let R be the relation called congruence modulo 3 defined by: $R = \{< x, y > / x \in z \cap y \in z \cap (x - y) \text{ is divisible by } 3\}$, determine the equivalence classes generated by the elements of z.

(b) Let $X = \{2, 3, 6, 12, 24, 36\}$ and the relation $\leq$ be such that $x \leq y$ if $x$ divides $y$. Draw the Hasse diagram of $< x, \leq >$.

**OR**

5 Let $F_x$ be the set of all one to one, onto mappings from X onto X = {1, 2, 3, 4}. Find all the elements of $F_x$ and find the inverse of each element.

### UNIT – III

6 (a) Prove that a subset $S \neq \phi$ of G is a subgroup of $< \mathbf{G}, * >$. If for any pair of elements $a, b \in S, a * b^{-1} \in S$.

(b) Show that every cyclic group of order n is isomorphic to the group $< Z_n, t_n >$.

**OR**

7 (a) Let $< L, \leq >$ be a lattice in which * and $\oplus$ denote the operations of meet and join respectively. For any $a, b \in L \quad a \leq b = a \Leftrightarrow a \oplus b = b$

(b) In a bounded lattice $< L, *, \oplus, 0.1 >$, an element $b \in L$ is called a complement of an element $a \in L$ if a*b = 0 and $a \oplus b = 1$.

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UNIT – IV

8 Explain the merge sort with an example and algorithm.

**OR**

9 (a) Explain the weighted trees and prefix codes thoroughly.

(b) What is spanning tree? Illustrate with one example.

UNIT – V

10 In how many ways can the 26 letters of the alphabet be permitted so that none of the patterns car, dog, pun or byte occurs?

**OR**

11 Use generating functions to determine how many four elements subsets of $S = \{1, 2, 3, \dots . 15\}$ contains no consecutive integers.

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