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 $P \to Q, Q \to R$ and P.

OR

3 Obtain the principal disjunctive normal form of:

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

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

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 $a \oplus b = 1$.

Contd. in page 2

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 $S = \{1, 2, 3, \ldots. 15\}$ contains no consecutive integers.

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