Exam.Code:0915
Sub. Code: 6393

2063
B.E. (Computer Science and Engineering)
Third Semester
CS-303: Discrete Structures

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: ***Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section.***

x-x-x

1. Briefly explain the following with example:
   (a) Reflexive and Irreflexive relations
   (b) K-Regular graph
   (c) Monoid
   (d) Recurrence relation
   (e) Quantifiers **(5x2=10)**

Section-A

2. (a) Consider the universal set U={1,2,3,4,…,10} and the subsets A={1,7,8}, B={1,6,9,10}, C={1,9,10. List the non-empty minsets and maxsets generated by A, B and C. Do the minsets and the maxsets form a partition of U? **(4)**
   (b) Let R be a relation defined on the set of positive integers such that for all $x,y \in Z^+$, xRy if and only if $|x-y|<7$. Determine whether R is an equivalence relation. **(4)**
   (c) Is the Implication and its inverse logically equivalent? Justify your answer. **(2)**
3. (a) Show that the mapping f: R→R be defined by f(x) = ax + b, where a, b, $x \in R$, $a \neq 0$ is invertible. Find its inverse. **(4)**
   (b) Prove that there is no largest integer that is a multiple of 5 using a suitable method of proof. **(3)**
   (c) Show that $\forall x(P(x) \vee Q(x)) \Rightarrow \forall xP(x) \vee \exists xQ(x)$. **(3)**

4. (a) Let D_{100} = {1, 2, 4, 5, 10, 20, 25, 50, 100} whose all the elements are divisors of 100. Let the relation < be the relation | (divides) be a partial ordering on D_{100}.
   I. Draw the Hasse diagram of the given poset.
   II. Determine the glb of {10,20} and {5,10,20,25}
   III. Determine the lub of (10,20} and {5,10,20,25} **(5)**
   (b) Show the implication $p \rightarrow q \Rightarrow p \rightarrow (p \wedge q)$ without using truth table. **(3)**
   (c) Let R be a binary relation on A such that (a, b) ∈ R, if book 'a' costs more and contains fewer pages than book 'b'. Is R an Equivalence Relation or a Partial Order Relation? Justify. **(2)**

P.T.O.

Section-B

5. (a) Prove that total number of permutations of n different things taken not more than r at a time, when each thing may be repeated any number of times is $n(n^r-1)/(n-1)$. **(5)**

   (b) Consider $a \epsilon R$ as a constant real number. Assume $G = \{a^n : n \epsilon Z\}$. Prove that G is an abelian group under usual multiplication. **(5)**

6. (a) Solve the recurrence relation $a_r+5a_{r-1}+6a_{r-2}=3r^2$. **(6)**

   (b) Define order and size of a graph. Describe Complement and Subgraph of a graph giving examples. **(4)**

7. (a) Discuss the Breadth-First Traversal technique using a suitable example. **(6)**

   (b) Define an algebraic structure. Differentiate between a ring and a field. **(4)**

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