Exam.Code:0915
Sub. Code: 6778

1129

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. 1 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}

   I. List the non-empty minsets generated by A, B and C. Do the minsets form a partition of U?

   II. How many elements of U can be generated by A, B and C?

   III. Compare the number obtained in II. with n(P(U)). **(4)**

   (b) If R be a relation in the set of integers Z defined by R = {(x, y): x ϵ Z, y ϵ Z, (x-y) is divisible by 6}. Then prove that 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 ϵ R, a ≠ 0 is invertible. Find its inverse. **(4)**

   (b) Determine the negation of the following statements

   I. $\forall_x \forall_y \forall_z$, p(x, y, z)

   II. $\forall_x \exists_y$, p(x, y)

   III. $\forall_x \forall_y$ (p(x) ∧ q(y)) **(3)**

   (c) Consider the function f: N→N, where N is the set of natural numbers including zero defined by f(n) = $n^2 + 2$. Check whether the function f is (i) one-one (ii) onto. **(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}.

P.T.O.

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) Prove the validity of following arguments without using truth tables.

I. $p \vee q, \neg p \vdash q$
II. $p, p \rightarrow q, q \rightarrow r \vdash r$
III. $p \rightarrow (q \vee r), (s \wedge t) \rightarrow q, (q \vee r) \rightarrow (s \wedge t) \vdash p \rightarrow q$ **(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)**

Section-B

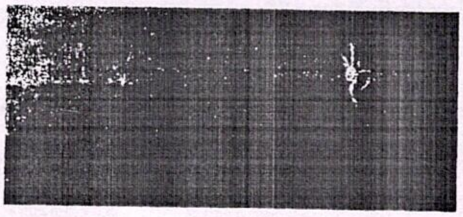
5. (a) Prove that total number of permutations of n different things taken not more than r at a time, when each thing may be repeated any number of times is $n(n^r-1)/(n-1)$. **(5)**

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

6. (a) Solve the recurrence relation $a_r-2a_{r-1}+a_{r-2}=2^r$, r>= 2, by the method of generating function satisfying the boundary conditions $a_0=2$, $a_1=1$. **(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 the given graph. **(6)**



(b) What do you understand by counting techniques? Explain. **(2)**

(c) Define an algebraic structure. Differentiate between a ring and a field. **(2)**

x-x-x