Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐ **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech. (CSE/IT) (Sem.–3rd)

DISCRETE STRUCTURES

Subject Code : BTCS-302 (2011 Batch)

Paper ID : [A1124]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

SECTION-A

1. Write short notes on :

   (a) Define an equivalence relation on a set.

   (b) Give an example of a partial order relation on the set $\angle 1$ of integers.

   (c) Prove that the intersection of any two left ideals of a ring is also a left ideal of the ring.

   (d) Give an example of a Boolean Algebra.

   (e) Find the number of different messages that can be represented by sequences by 4 dots and 6 dashes.

   (f) What is the minimum number of people with the same last initials in a group of 85 people.

   (g) Define a semigroup and a monoid.

   (h) Let $\angle 1$ be the additive group of integers. Prove that map $f : \angle 1 \rightarrow \angle 1$ defined by $f(x) = 2x$, $x \in \angle 1$ is a group isomorphism.

   (i) Define a simple graph and a complete graph.

   (j) Find the chromatic number of the complete bipartite graph $K_{3, 4}$.

SECTION-B

2. Let H : K $\rightarrow$ L be a hash function where L consists of two digit addresses 00, 01, 02, ..., 49. Find H (12304) using :

   (i) Division method and

   (ii) Folding method.

3. Let G be a finite group and H be a subgroup of G. Prove that order of H divides the order of G.

4. List any five properties of a graph which are invariant under graph isomorphism.

5. Let T : R $\rightarrow$ S be a ring homomorphism. Define Ker (T), the kernel of T. Prove that Ker(T) is a two sided ideal of R.

6. Find the minimum number of persons selected so that at least eight of them will have birthdays on the same day of the week.

SECTION-C

7. Design a three-input-minimal AND-OR circuit with the following truth table :

   T = {A, B, C ; L} = {00001111, 00110011, 01010101, 11001101}.

8. Solve the recurrence relation :

   $a_n - 4a_{n-1} = 6.4^n$, $a_0 = 1$.

9. Prove that it is not possible be supply three utilities to three places by conduits without crossing over.