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

Total No. of Questions : 09

B.Tech.(CSE/IT) (Sem.–3)

DISCRETE STRUCTURES

Subject Code : CS-203

Paper ID : [A0452]

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

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY.**
2. **Attempt any FOUR questions from SECTION-B.**
3. **Attempt any TWO questions from SECTION-C.**

SECTION-A (10 × 2 = 20 Marks)

l. (a) Show that the sum of the degrees of the vertices of a non directed graph is twice the number of edges in the graph.

(b) Define the terms (i) Regular graph (ii) Complete graph

(c) Give an example of a graph that has neither an Euler circuit nor a Hamiltonian circuit.

(d) Define a tree.

(e) Define an equivalence relation and give an example of the same.

(f) If $a^{-1} = a \ \forall a \in G$, where G is a group, then show that G is commutative.

(g) $\forall a,b \in R$ where R is a ring, show that (-a).(-b) = a.b

(h) Every field is an integral domain. Give an example to establish that the converse is not true.

(i) In a Boolean algebra B, show that, a + a = a $\forall a \in B$.

(j) What is the generating function for the sequence $S_n = ba^n$, $n \geq 0$?

SECTION-B (4 × 5 = 20 Marks)

2. Among the first 1000 positive integers:

   (a) Determine the integers which are neither divisible by 5, nor by 7, nor by 9.

   (b) Determine the integers divisible by 5 but not by 7, not by 9.

3 Solve the recurrence relation $S(K) - 4S(K-1) + 3S(K-2)\ K^2$, without using the concept of generating functions.

4 Let R be the relation on the set of ordered pairs of positive integers such that (a,b) R (c,d) if and only if a+d = b+c. Show that R is an equivalence relation.

5. State and prove the Lagrange's theorem.

6. Consider the Boolean function, f(x,y,z) = (x.y + z).(x □+ y.z □).(x □□ z) Construct the circuit corresponding to the Boolean function of the Boolean algebra of switching circuits.

SECTION-C (2 × 10 = 20 Marks)

7. Show that every field is an integral domain.

8. Consider any connected planar graph G=(V,E) having R regions, V vertices and E edges. Show that V+R-E = 2.

9. Find the generating function from the recurrence relation

   S(n - 2) = S(n - 1) + S(n) where S(0) = S(l) =1, n □ 0.