[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
(2064)

14680

B. Tech 4th Semester Examination

Discrete Structures (O.S.)

CS-4002

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all selecting one from each of the Sections A, B, C & D. Section E is compulsory.

SECTION - A

1. (a) If A, B and C are three non-empty sets, prove that $A-(B\cup C) = (A-B)\cap(A-C)$. (10)

   (b) Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9}, A = {1, 2, 3, 7}, B = {4, 5, 6, 7}, C {1,3, 6}.
   Compute: (i) $A\cap B$, (ii) A-B, (iii) $A\cap(B\cup C)$, (iv) $\sim A\cup\sim C$. (10)

2. (a) List the members of sets A={x | x is a prime number between 10 and 20} and B={x | x=3k+2 where k is an integer and 2<k<8}. Find A-B. (10)

   (b) State and explain two De Morgan laws using suitable examples. (10)

SECTION - B

3. (a) Show that $p \Leftrightarrow q$ and $\neg p \Leftrightarrow \neg q$ are equivalent. (10)

   (b) Let A = {1, 2, 3, 4, 5, 6, 7} and B = {1, 3, 5}. Give $A \oplus B$. (10)

4. (a) Define tautology. Prove that for any proposition p, q, r the compound proposition $[(p \to q) \wedge (q \to r)] \to (p \to r)$ is a tautology. (10)

   (b) If R_1 and R_2 are equivalence relations on a set X then prove that $R_1 \cap R_2$ is an equivalence relation. Give a counter example to show that $R_1 \cup R_2$ need not be an equivalence relation. (10)

SECTION - C

5. (a) Prove that the intersection of any two subgroups of a group G is again a subgroup of G. (10)

   (b) What is adjacency matrix? How will you draw adjacency matrix for a given undirected graph? Give example. (10)

6. (a) Let T be a tree. Prove that removing any edge from T produces a graph, T' that is not connected. (10)

   (b) Write note on:

   (i) Homographic graphs

   (ii) Recurrence relation (10)

SECTION - D

7. (a) Show that maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$ (10)

   (b) Given A = {1, 2, 3, 4, 5} and B = (1, 3, 5}. Let R be the relation from $A \to B$ define by "x is greater than y" .Write relation R, its matrix and draw its graph. (10)

8. (a) State and prove the condition to find out if a given graph is an Euler graph. (10)

   (b) Define spanning tree. Write the Prim's algorithm to find a minimal spanning tree of a weighted graph. (10)

SECTION - E

9. (a) List all partitions of the set {a, b,c}.

   (b) Prove that for any 3 sets A, B and C, $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

   (c) Define symmetric relation with an example.

   (d) Prove that $\overline{A \cup B} = \overline{A} \cap \overline{B}$.

   (e) When is a simple graph G bipartite? Give an example.

   (f) Let A and B be sets. Prove that $(A-B) \cap (B-A) = \phi$.

   (g) Let A = {a, b, c}, find A×A.

   (h) Define propositional calculus.

   (i) Explain preorder traversal of a binary tree.

   (j) How do you represent graphs inside computer? Explain.

(2×10=20)