BE (Third Semester)

Information Technology

Discrete Structures - 333352(14)

2013 - Winter Session , New Scheme

Chapter 1

1 Verify that the proposition $p \wedge (q \wedge \sim q)$ is a contradiction. **2**

2 Define principle disjunctive normal form. Obtain PDNF of $p \wedge q$ using truth table. **7**

3 Define Boolean algebra and prove that in a Boolean algebra B the elements 0 and 1 are unique. **7**

4 Find the logic networks corresponding to the Boolean expressions (i) AB + CD and (ii) X'Y'Z + X'YZ + XY' **7**

Chapter 2

1 Prove that there are 2^n subsets of a set having n elements. **2**

2 Define equivalence relation , Show that the relation (x,y) R (a,b) ⇔ $x^2 + y^2 = a^2 + b^2$ is an equivalence relation on the plane and describe the equivalence classes. **7**

3 Define inverse mapping and show that inverse of a mapping, if it exists, is unique. **7**

4 Define composition of mappings and show that the functions *f(x)* $= x^3$ and *g(x)* $= x^{1/3}$ for all x of R are inverses of each other. **7**

Chapter 3

1 Define a binary operation with an example. **2**

2 Define a subgroup and prove that the intersection of two subgroups of a group G is also a subgroup of G. Also prove by an example that the union of two subgroups is not necessarily a subgroup. **7**

3 Prove that the order of every element of a finite group is a divisor of the order of the group. **7**

4 Distinguish between an internal domain and a field. Prove that every field is an integral domain. Is the converse true ? **7**

Chapter 4

1 Draw the graphs of the chemical molecules of (i) C_3H (ii) C_3H_8 **2**

2 Show that the maximum number of edges in a simple graph with n vertices is n(n-1)/2. **7**

3 Give an example of a graph which is Hamiltonian but not Eulerian and vice-versa. **7**

4 A tree has two vertices of degree 2, one vertex of degree 3 and three vertices of degree 4. How many vertices of degree 1 does it have ? **7**

Chapter 5

1 Find the number of ways in which 7 different beads can be arranged to form a necklace. **2**

2 State Shoe Box principle. Show that in any room of people who have been doing handshaking there will always be at least two people who have shaken hands the same number of times. **7**

3 Use generating function to solve the recurrence relation $a_n = 3a_{n-1} + 2$, $a_0 = 1$. **7**

4 Use mathematical induction to prove that $\sum n^2 = n(n+1)(2n+1)/6$ **7**