

# Assignmant-1

## 4th Sem CSE

### Discrete Mathematical Structures

**Ques 1.** Define

1. Propositional connectives
2. Tautologies and Contradiction.
3. Valid Argument
4. Boolean Algebra

**Ques 2.** Prove that the following proposition are tautology:

1.  $(p \Leftrightarrow q) \Leftrightarrow (p \Rightarrow q) \wedge (q \Rightarrow p)$
2.  $(p \Leftrightarrow q) \wedge (q \Leftrightarrow r) \Rightarrow (p \Leftrightarrow r)$
3.  $\sim (p \wedge q) \vee q$

**Ques 3.** Express the Boolean function  $f(a, b, c) = [(a + b)' + (a' \cdot c)]'$  in disjunctive normal form and conjunctive normal form.

**Ques 4.** For the following function, draw a switching circuit and also give a simpler switching circuit:

$$x.y' + x.y$$

**Ques 5.** For the following function, draw a switching circuit and also give a simpler switching circuit:

$$f(x, y, z) = x.y.z + x.y'.z + x'.y'.z$$

**Ques 6.** Show that

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \dots + \frac{1}{n \cdot (n+1)} = \frac{n}{n+1}, \quad n \geq 1$$

by mathematical induction.

**Ques 7.** Show that among 1000 people, there are at least 84 people who are born in the same month

**Ques 8.** Calculate the number of positive integers less than 500, which are divisible by 3, 5, or 7.

**Ques 9.** Solve the recurrence relation  $a_n - 10a_{n-1} + 25a_{n-2} = 8 \cdot 5^n$

**Ques 10.** Solve by the method of generating functions the recurrence relation  $a_r - 4a_{r-1} - 5a_{r-2} = 3$ ,  $r \geq 2$  with boundary conditions  $a_0 = 3$  &  $a_1 = 5$ .