

Lecture-12 Main Points

- In CSE one often considers the two element BA on $\{0, 1\}$ only.

Examples:

- Truth table method to find CNF and DNF.
- Karnaugh maps for optimization of Boolean functions.
- In the following, we also restrict ourselves to BA **2**.
- Satisfiability
 - Definition was given.
 - A formula is valid iff its negation is unsatisfiable.
 - No efficient (polynomial time) algorithm known to check satisfiability on all inputs.
- Importance of SAT
 - Many other practical problems admit efficient algorithm iff SAT does.
 - Examples: Hamiltonian cycle problem, k -clique problem etc.
 - These problems are all NP-complete.
(Precise def. this in future courses).
- Class NP
 - Decision problems
 - Consists of problems for which there is some Q and a polynomial p s.t.
 - * on input x answer is yes iff $\exists |y| \leq p(|x|)[Q(x, y)]$
 - * Q is a polynomial time checkable predicate.

- Guess and verify. Verification is easy but guesses are exponentially many.
- Special cases of SAT
 - CNF SAT and 3-CNF SAT are NP-complete.
 - DNF SAT is in linear time.
 - Horn clauses SAT is $O(n^2)$.