1. Design an algorithm to solve the network flow problem with source \( s \) and sink \( t \) on an undirected graph with each edge having capacity one and analyze its time complexity.

2. Design an algorithm to find a matching with maximum size on a tree and analyze its time complexity.

3. Express the problem of finding a maximum independent set \( C \) in an undirected graph \( G = (V, E) \) so that for each \((v, w)\) in \( E\), at most one of \( v \) or \( w \) is in \( C \) as an integer linear programming problem.

4. Given a satisfiable boolean formula in conjunctive normal form that consists of clauses connected by \( \land \) in which each clause consists of literals connected by \( \lor \) with each literal being a variable or a negated variable, design an algorithm to find a satisfying truth assignment with positive probability.

5. Give an informal description of a nondeterministic Turing machine for the language \( L = \{w^c \mid w \in \{0, 1\}^*\} \) for a given constant \( c \).