1. (6 points) For the following pair of languages \((L_1, L_2)\) over \(\{a, b\}\), give a polynomial time Turing Machine reduction of \(L_1\) to \(L_2\), and give the time complexity (using \(O\)-notation) of your reduction.

\[
L_1 = \{a^i b^{2i} | i \in \mathbb{N}\}, \quad L_2 = \{a^i b^i | i \in \mathbb{N}\}
\]

2. (4 points) Construct an instance of SATISFIABILITY consisting of four clauses over \(\{u_1, u_2, u_3\}\) such that the conjunction of any three of the clauses is satisfiable but the conjunction of all four clauses is not satisfiable.