Theory of Computation

Final Examination

CSIE210039

National Chi Nan University

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Problem 1 (25 points) Explain why we adopt log-space reduction instead of polynomial-time reduction in the theory of completeness.

Problem 2 (25 points) Show that NP is closed under log-space reduction.

Problem 3 (25 points) Let F be an instance of NAESAT. Show that the number of (feasible) solutions of F must be even.

Problem 4 (25 points) In the SUBGRAPH ISOMORPHISM PROBLEM, we are given two graphs $G = (V_1, E_1)$ and $H = (V_2, E_2)$ and want to decide whether G contains a subgraph isomorphic to H. That is, find a subset $V \subseteq V_1$ and a subset $E \subseteq E_1$ such that $|V| = |V_2|$ and $|E| = |E_2|$, and there exists a one-to-one function $f : V_2 \to V$ satisfying $\{u, v\} \in E_2$ if and only if $\{f(u), f(v)\} \in E$. Show that SUBGRAPH ISOMORPHISM PROBLEM is NP-complete.