

科目：計算理論 A

日期：106 年 1 月 18 日 第 1 頁 共 1 頁

請“✓”明 ✓不可看書 可看書

* 請將答案依題號順序寫入答案卷

答題時字跡需工整，否則不予計分。Write your answers legibly; otherwise you will get zero score.

1. (25%) This is about solvable and semi-solvable problem.
 - (A) What is a solvable problem?
 - (B) What is a semi-solvable problem?
 - (C) Show that if f is computable and strictly increasing (that is, $f(x) < f(y)$ for any $x < y$), then the problem of determining whether a value y is in the range of f , that is, there exists x such that $f(x) = y$, is solvable.
 - (D) Give a semi-solvable algorithm for the following problem: given two Turing machines M_1 and M_2 , determine whether there exists x that is accepted by both M_1 and M_2 .
2. (25%) A vertex cover for a graph $G=(V, E)$ is a set $C \subseteq V$ such that for every $(u, v) \in E$, either u or v is in C . The vertex cover problem is that, given (G, k) , determine whether G has a vertex cover C of at most k nodes.
 - (A) Give a non-deterministic polynomial-time algorithm to solve the vertex cover problem.
 - (B) Give a method Φ of reducing the 3SAT problem to the vertex cover problem in polynomial time.
 - (C) Show the above method Φ is correct by showing that for any 3SAT instance σ that is satisfiable if and only if $\Phi(\sigma)$ is vertex-coverable.

國立交通大學試題紙

一百零五學年度第一次
博士班資格考

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答題時字跡需工整，否則不予計分。Write your answers legibly; otherwise you will get zero score.

1. (10%) Prove or disprove that the class of regular languages is closed under the operation of complementation.
2. (10%) Prove or disprove that the class of context languages is closed under the operation of complementation.
3. (10%) Prove or disprove that the union of two non-regular languages is a non-regular language.
4. (10%) Let $L_4 = \{a^n b^n \mid n \geq 0\}$. Prove or disprove $\overline{L_4}$ is context free.
5. (10%) Prove or disprove that $L_5 = \{a^n b^\ell \mid n \neq \ell\}$ is regular.