

科目：計算理論 A

日期：103 年 1 月 22 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. (10%) Prove or disprove that if L is regular and $L' \subseteq L$, L' is regular.
2. (10%) Prove or disprove that if L is regular and $L' = \{ yx \mid xy \in L \}$, L' is regular.
3. (10%) Prove or disprove that $L = \{ a^m b^n c^p d^q \mid m + n = p + q \}$ is context-free.
4. (10%) Prove or disprove that $L = \{ a^n b^n c^m \mid n \neq m \}$ is context-free.
5. (10%) Prove or disprove that $L = \{ a^n b^n \mid n \geq 0, n \neq 5m, m \geq 0 \}$ is context-free.

◎請用深黑色鋼筆或原子筆出題

命題老師簽名：

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1. (10%) Show that A_{TM} is not mapping reducible to E_{TM} , where $A_{TM} = \{\langle M, w \rangle : M \text{ is a TM and } M \text{ accepts } w\}$ and $E_{TM} = \{\langle M \rangle : M \text{ is a TM and } L(M) = \emptyset\}$.
2. (10%) Let $EQ_{TM} = \{\langle M_1, M_2 \rangle : M_1 \text{ and } M_2 \text{ are TMs and } L(M_1) = L(M_2)\}$. Prove that EQ_{TM} is undecidable.
3. (12%) Vertex Cover Problem: We say a subset A of the vertex set V of a graph G is a vertex cover for G if every edge contains at least one vertex in A . Given a graph G and a positive integer k , determine whether G has a vertex cover of size at most k .
Prove that Vertex Cover Problem is NP-complete.
4. (18%) Does the Vertex Cover Problem remain NP-complete if each edge is to be covered by exactly one vertex?

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