國立交通大學試題紙

九十七學年度第一次
博士班資格考

科目：計算理論 (A)　　日期：98 年 2 月 5 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. (5%) Give a formal definition of Turing machines.
2. (15%) Let L={ $\langle M_1, M_2 \rangle$ | M_1 and M_2 are TM's with either $L_1=(M_1)\neq\varnothing$ or $L(M_2)=\varnothing$ }. Prove or disprove that L is recursive.
3. (10%) Show that if both of L and $\bar{L}$ are recursively enumerable, then L is recursive.
4. (20%) An independent set of an undirected graph G=(V, E) is a subset U of V such that no nodes in U are connected.
   (1) Design a polynomial-time NTM to accept the language IS={$\langle$G, k$\rangle$ | graph G has an independent set of size at least k}.
   (2) Show that the above language IS is NP-complete by reducing from the 3SAT problem.

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九十七學年度第一次
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科目：計算理論 (B)

日期： 98 年 2 月 5 日 第 1 頁 共 1 頁

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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 following language

$$\{wtw^R \mid w, t \in \{0,1\}^*, |w| \geq 1\}$$

is regular, where w^R denotes the reverse of string w.

2. (10%) Prove or disprove that if L_1 is regular and $L_1 \cup L_2$ is also regular, L_2 is regular.

3. (10%) Prove or disprove that the following language

$$\{wtw^R \mid w, t \in \{0,1\}^*, |w| = |t|\}$$

is context free, where w^R denotes the reverse of string w.

4. (10%) Prove or disprove that if L_1 is context free and L_2 is regular, $L_1 - L_2$ is context free.

5. (10%) Prove or disprove that the string 00110110 can be generated by grammar $G = \{\{S, A, B\}, \{0, 1\}, P, S\}$, where P contains the following productions:

$$\begin{aligned} S &\rightarrow 00B \\ A &\rightarrow 1B1 \mid \varepsilon \\ B &\rightarrow A0 \end{aligned}$$