

國立交通大學試題紙

九十六學年度第二次
博士班資格考

科目：計算理論 (A)

日期：97 年 7 月 24 日 第 1 頁 共 2 頁

請“✓”明 ✓不可看書 可看書

* 請將答案依題號順序寫入答案卷。(1-5 題請作答於 A 答案卷，6-9 題請作答於 B 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 every NFA can be converted to an equivalent one that has a single accept state.

2. (10%) Prove or disprove that for each $n \geq 1$, B_n is regular, where

$$B_n = \{a^k \mid \text{where } k \text{ is a multiple of } n\}.$$

3. (10%) Prove or disprove that C is regular, where

$$C = \{1^k y \mid y \in \{0, 1\}^* \text{ and } y \text{ contains at most } k \text{ 1's, for } k \geq 1\}.$$

4. (10%) Let D be the language of all palindromes over $\{0, 1\}$ containing an equal number of 0's and 1's. Prove or disprove that D is context free.

5. (10%) Let G be a CFG in Chomsky normal form that contains b variables. Prove or disprove that, if G generates some string with a derivation having at least 2^b steps, $L(G)$ is infinite.

科目：計算理論 (B)

日期：97 年 7 月 24 日 第 2 頁 共 2 頁

* 下列題目請作答於 B 答案卷

6. (10%) Language A is *mapping reducible* to language B , written $A \leq_m B$, if there is a computable function $f : \Sigma^* \rightarrow \Sigma^*$, where for every w , $w \in A \iff f(w) \in B$. Is the following statement true? If $A \leq_m B$ and $B \in NP$, then $A \in NP$. Prove your answers. Answers without any explanation will not get any credit.
7. (10%) Show that the set of $\langle M, w \rangle$ pairs such that M halts when given input w is RE but not recursive.
8. (15%) A *2cnf-formula* is an AND of clauses, where each clause is an OR of at most two literals. Let $2SAT = \{ \langle \phi \rangle \mid \phi \text{ is a satisfiable 2cnf-formula} \}$. Is $2SAT$ an NP -complete problem? Prove your answer.
9. (15%) Prove the following problem is NP -complete: Given graphs G and H , does G contain a copy of H as a subgraph?