

# 國立交通大學試題紙

科目：計算理論 (A)

日期：96 年 7 月 26 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冊

1. (10%) Prove that, if  $G$  is a CFG in Chomsky normal form, then for any string  $w$  in  $L(G)$  of length  $n \geq 1$ , exactly  $2n-1$  steps are required to derive  $w$ .
2. (10%) Let  $x$  and  $y$  be strings and let  $L$  be any language. We say that  $x$  and  $y$  are distinguishable by  $L$  if some string  $z$  exists whereby exactly one of the strings  $xz$  and  $yz$  is in  $L$ ; otherwise, for every string  $z$ ,  $xz$  is in  $L$  whenever  $yz$  is in  $L$  and we say  $x$  and  $y$  are indistinguishable by  $L$ . If  $x$  and  $y$  are indistinguishable by  $L$  we write  $x =_L y$ . Show that  $=_L$  is an equivalence relation.
3. (6%) Prove that the following problem without pumping lemma  $\{0^m 1^n \mid m \neq n\}$  is not regular.
4. (14%)(a) Give a context-free grammar that generates the language  $A = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and either } i=j \text{ or } j=k\}$ . (b) Show that the class of regular languages is closed under the operations union, concatenation, and star.
5. (10%) Use the fact that the language  $\{a^n b^n c^n \mid n \geq 1\}$  is not a CFL.

Show that the language  $D = \{w \mid w \in \{a, b, c\}^* \text{ and contains equal numbers of } a\text{'s, } b\text{'s and } c\text{'s}\}$  is not context free. Prove your answer without using the pumping lemma.