

科目：計算理論 A

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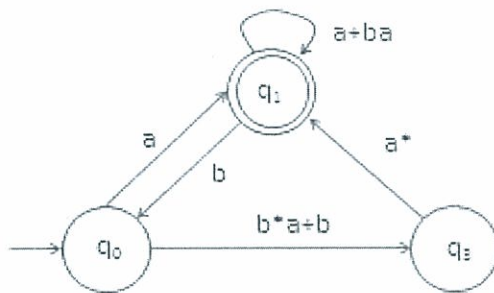
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* 請將答案依題號順序寫入答案卷

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. (15%) Use the pigeonhole principle to show that the language $L = \{w \in \{a,b\}^* : n_a(w) > n_b(w)\}$ is not regular.

2. (15%) Write a regular expression for the following generalized transition graph.



3. (20%) Let CFG $G = (\{S, A, B, F\}, \{a, b\}, S, \{S \rightarrow AF \mid SS \mid AB, F \rightarrow SB, A \rightarrow a, B \rightarrow b\})$.

Consider the CYK algorithm for parsing a string $w = a_1 a_2 \dots a_m$. Let $V_{i,j}$ be the set of the variables that generate substring $a_i a_{i+1} \dots a_j$, $i \leq j$.

(a) Give the formula of computing $V_{i,j}$ from other $V_{k,l}$'s.

(b) Let $w = \underline{aabbab}$. Compute all $V_{i,j}$ for $1 \leq i \leq j \leq 6$ by using the CYK algorithm.

科目：計算理論 B

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1. (a) (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 , $w \in A \iff f(w) \in B$. Prove that if $A \leq_m B$ and B is decidable, then A is decidable.
(b) (10%) If B is NP-complete and $B \leq_p C$ for C in NP, then C is NP-complete. Prove this statement.
2. (20%) Prove the following problem is NP-complete: Let $G(V, E)$ be an undirected graph. Determine if G has a clique of size at least $|V|/2$.
3. (a) (5%) What is the Rice Theorem?
(b) (5%) What is the PCP problem?

◎ 請用深黑色鋼筆或原子筆出題

命題老師簽名：