

CS30053 Foundations of Computing, Autumn 2005

Class test 1

Total marks: 20

September 08, 2005

Duration: 1 hour

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Name: \_\_\_\_\_ Roll No: \_\_\_\_\_

*Answer all questions in the respective spaces provided.  
Use extra sheets for rough work. Any such extra sheet will not be corrected.*

1. Design a finite automaton (deterministic or nondeterministic) to recognize the language (5)

$\{\alpha \in \{a, b\}^* \mid \text{the number of } a\text{'s in } \alpha \text{ minus the number of } b\text{'s in } \alpha \text{ is not a multiple of } 3\}$ .

2. Design a finite automaton (deterministic or nondeterministic) to recognize the set of strings over the alphabet  $\{a, b, c\}$ , generated by the regular expression  $(aa \cup b)c(aa \cup b)^*$ . (5)

3. Consider the language

$$L = \{a^i b^j c^k \in \{a, b, c\}^* \mid i, j, k \geq 0 \text{ and } i + j = k\}.$$

(a) Prove that  $L$  is not regular.

(5)

(b) Design a context-free grammar  $G$  with  $\mathcal{L}(G) = L$ .

(5)