

INDIVIDUAL HOMEWORK 7, CPSC 421/501, FALL 2021

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Please note:

- (1) You must justify all answers; no credit is given for a correct answer without justification.
- (2) Proofs should be written out formally.
- (3) Homework that is difficult to read may not be graded.
- (4) You may work together on homework in groups of up to four, **but you must write up your own solutions individually and must acknowledge with whom you worked.** You must also acknowledge any sources you have used beyond the textbook and two articles on the class website.

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- (1) Give a formal description (by a state diagram, or table of δ values, or a list of δ values) of a Turing machine that recognizes the language over $\Sigma = \{a, b\}$ given by

$$\{w \in \Sigma^* \mid w \text{ contains } aab \text{ as a substring}\}.$$

Make sure to explain how your machine works, and what each state “means” in terms of your algorithm; make sure that it is clear what are the values of $Q, \Gamma, q_0, q_{\text{accept}}, q_{\text{reject}}$.

- (2) Give a formal description (by a state diagram, or table of δ values, or a list of δ values) of a Turing machine that recognizes the language over $\Sigma = \{0, 1\}$ given by

$$L = \{w \in \{0, 1\}^* \mid w \text{ has more 0's than 1's}\}.$$

Make sure to explain how your machine works, and what each state “means” in terms of your algorithm; make sure that it is clear what are the values of $Q, \Gamma, q_0, q_{\text{accept}}, q_{\text{reject}}$.

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