INDIVIDUAL HOMEWORK 5, CPSC 421/501, FALL 2020

JOEL FRIEDMAN

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) Use the Myhill-Nerode theorem to show that
$$L = \big\{ w = uu \mid \text{for some } u \in \{0,1\}^* \big\}$$
is nonregular.

(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
$$L = \mathrm{PALINDROME}_{0,1} = \{w \in \{0,1\}^* \mid w = w^{\mathrm{rev}}\},$$
where if $w = \sigma_1 \ldots \sigma_k \in \{0,1\}^k$, then $w^{\mathrm{rev}} = \sigma_k \ldots \sigma_1$. 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 $Q, \Gamma, q_0, q_{\mathrm{accecpt}}, q_{\mathrm{reject}}$.

Department of Computer Science, University of British Columbia, Vancouver, BC V6T 1Z4, Canada.
E-mail address: jf@cs.ubc.ca
URL: http://www.cs.ubc.ca/~jf