CS 205: Formal Languages, Automata Theory and Computation
Homework # 4, Winter 2020-21
Due Date: End of 12-04-2021, Monday

Important

1. Typeset your answers using LaTeX or MS Word. Upload a pdf file to TurnItIn as your submission. Also submit a copy to Teams, so that we can assign marks.
2. Identical answers by two students on the same problem will incur zero marks for both students for the problem.
3. Copying answers from the Internet will also be penalized by awarding zero marks.
4. Turnitin will be used to detect all types of copying. You must submit your answers in Turnitin.
5. Include your name and roll number at the top of your answer script.
6. Late submissions will incur 10% deduction for each day of delay from the total marks obtained.

1. Design a single tape Turing machine that takes as input a string $w \in \{0,1\}^*$ and produces as output (by overwriting the input) a string $w' \in \{0,1\}^*$ with the following property. If

$$w = b_1 b_2 b_3 b_4 \ldots b_n$$

then

$$w' = b_2 b_1 b_4 b_3 \ldots$$

i.e., w' has the same length n as w and for every odd i less than the length n of w, $w'_i = w_{i+1}$ and $w'_{i+1} = w_i$, where w_i refers to the ith symbol of w. If n is odd the last symbol of w' is the same as that of w. For example, if $w = 01010$ the $w' = 10100$ and if $w = 1001$ then $w' = 0101$.

You must give all the details of the Turing machine, including states and transitions. You must also give an explanation of how it works in English.

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