

CSI 409 — Fall 2017: Homework #2

Due date: Sep 22

Answer all questions on your own. Turn in your answers at the **beginning** of class. Write your preferred e-mail address (e.g. zz6000@csc). If you are using more than one sheet of paper, make sure that you *staple* all the sheets together.

Remember that collaboration of any kind is not allowed.

1. Construct a deterministic finite automaton (DFA) that recognizes the following language:

$$\left\{ w \in \{a, b\}^* \mid w \text{ starts with } b \text{ and contains } bb \text{ as a substring.} \right\}$$

The alphabet is $\{a, b\}$.

Note: bb is in the language and so should be accepted by the DFA.

2. Consider the language

$$a^*b \cup b^*$$

(i.e., $\{a\}^*\{b\} \cup \{b\}^*$).

The alphabet is $\{a, b\}$.

- (a) Construct a deterministic finite automaton (DFA) recognizing this language.
- (b) Show that any DFA that accepts this language has to contain a **dead state**.

Hint: Find a string w such that *any* string that has w as a prefix will not be in the language. It is not enough to exhibit one DFA for this language that has a dead state.