# CSI 409 — Fall 2017: Homework #7

Due date: Dec 6

Answer all questions on your own. Turn in your answers at the **beginning** of class. **PRINT YOUR NAME** (this is mandatory!) and 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. Consider the following Turing Machine. Its input alphabet is $\{a, b\}$. Transitions to the REJECT state are not shown. ("If stuck, reject.")
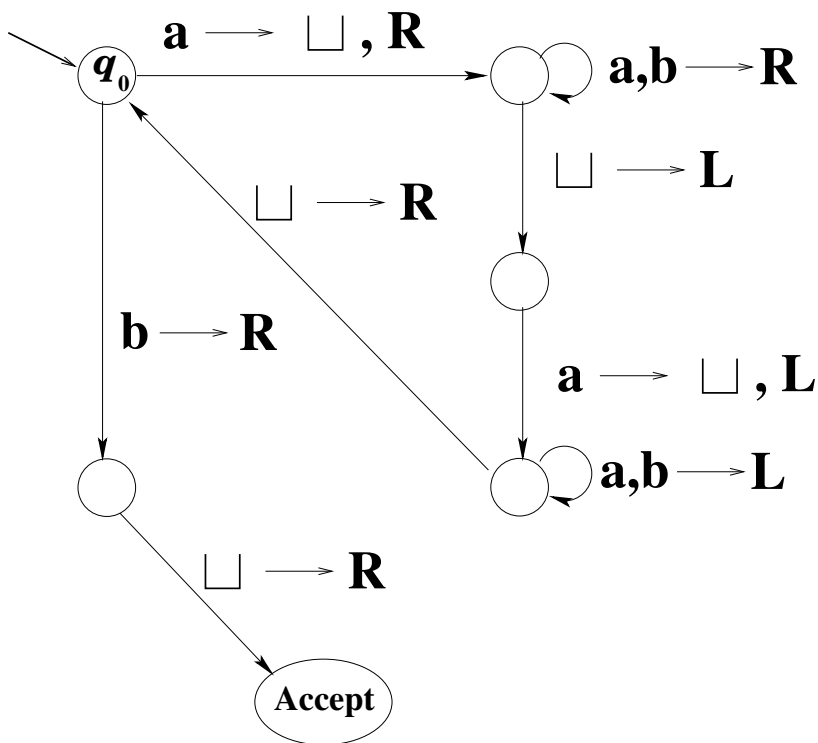
   (a) Exhibit a non-empty string over $\{a, b\}$ that this TM accepts.

   (b) Exhibit a non-empty string over $\{a, b\}$ that this TM does not accept.

see next page

(c) What language does this TM accept? (You should characterize it in terms of properties of the accepted strings.)

2. Exhibit a derivation of the string $a^2b^4c^2$ in the following grammar:

$$
\begin{aligned}
S &\rightarrow SABBC \mid X \\
CB &\rightarrow BC \\
CA &\rightarrow AC \\
BA &\rightarrow AB \\
XA &\rightarrow aX \mid aY \\
YB &\rightarrow bY \mid bZ \\
ZC &\rightarrow cZ \mid c
\end{aligned}
$$

What language does this grammar generate?