CSC236 Tutorial 10

1. Let $\Sigma = \{0, 1\}$. Let $L = \{x : x \in \Sigma^*, 11$ is a substring of $x, |x| \geq 2$ and the second last symbol of x is $1\}$.

   (a) Give a DFSA that accepts L.
   It is possible to give a correct DFSA with 6 states. One mark will be deducted for each extra state that your DFSA uses.

   (b) Prove an appropriate state invariant for your DFSA in part (a).
   Do not use regular expressions in your state invariant.

   Non regular Languages.

   Proving that regular languages are not regular by using closure properties of regular languages, and relying on the fact that we already know that some language is not regular. The proof would go along the following lines: assume towards contradiction that L is regular. Apply operations that regular languages are closed under (e.g., union, concatenation, star, intersection, or complement) on L and other regular languages, to reach a language that is not regular. Contradiction. Conclude that L is not regular.

2. Prove that $L_1 = \{w \in \{a, b\} : w$ has the same number of as and bs$\}$ is not regular.

3. Prove that $L_2 = \{w \in \{a, b\} | w = a^i b^j i \neq j\}$ is not regular.

4. The set of non-palindromes, i.e. the language $\{a, b\}$ PAL, where $PAL = \{w \in \{a, b\} | w = w^R\}$. (You can use the fact that PAL is known to be non-regular.)