

Student ID :
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Automata Teory Course Quiz-1.b (2016-2017Fall)

(Please use free space for draft and fit your answer to boxes.)

1. (50P) Consider a system run only at Saturday or Sunday. Prepare this system in NFA format. (You can consider each day pass as a symbol)

The system has only one symbol (let be 'a') for each day pass. Because a week has seven days (from Monday to Sunday) and each week starts at Monday, we can generalize our solution with a $(a^7)^*$. When a week starts at Monday, the system can accept the string after five or six 'day pass'. Thus the main solution must be $(a^5 \cup a^6)$. So after generalization;

$$(a^7)^*(a^5 \cup a^6)$$

1. (50P) Let X and Y be two binary words. If there are equal numbers of 'a's at X with 'b's at Y, prove that $L=\{XY\}$ language is not always regular.

At first, we can find a representation for a subset of the problem. For example if X is a^n and Y is b^n , we can accept XY as $a^n b^n$ which known as non-regular. For another example if X is $a^n b$ and Y is $a b^n$, we can accept XY as $a^n b a b^n$. Then, for $p = n$, regardless of how the string (s) is divided (into x, y, and z), when the third rule of Pumping Lemma is proceeded, for $i < > 1$, we will always shange the number of 'a's in X, and we will never obtain equal numbers of 'a's at X and 'b's at Y.