

CSE105 Closed Book Quiz, Thursday, Oct. 21, 1999

- Write a regular expression over the alphabet $\{\mathbf{a-z}, *, /\}$ that describes *simple comments*. A *simple comment* is any string which starts with $/$, ends with $*$, and has only lower-case letters (**a** through **z**) in between.

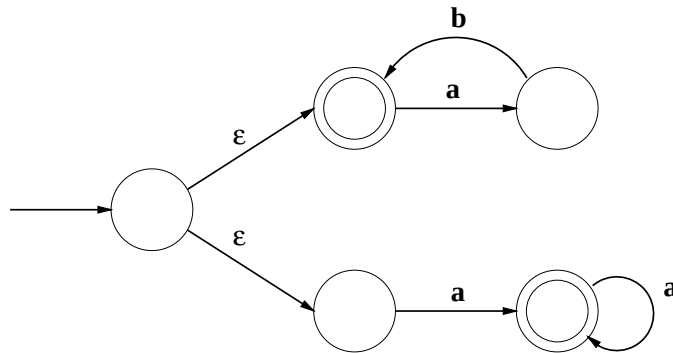
Let $\Sigma = \{a - z\}$. Then, the regular expression for the language of *simple comments* is

$$/*\Sigma^* */$$

- Construct an NFA that recognizes the language described by the regular expression

$$(a \circ b)^* \cup (a \circ a^*)$$

where $\circ$ is the concatenation operator.



- Show the following language is non-regular:

$$L = \{w w \mid w \text{ over alphabet } \{0,1\}\}$$

The proof is by contradiction. Assume L is regular. Then we know we can apply the pumping lemma. Let p be the pumping length given by the pumping lemma. Let the target string s be $0^p 1^p 0^p 1^p$. Since $s \in L$ and has length greater than p , We know that s can be partitioned into strings x , y , and z such that:

- $|xy| \leq p$;
- $|y| > 0$; and
- $\forall i \geq 0, xy^i z \in L$.

By conditions a and b , $y = 0^k$, where $0 < k \leq p$. However, $xy^3z = 0^{p+2k} 1^p 0^p 1^p$ is not in L since the first half ($0^{p+2k} 1^{p-k}$) differs from the second half ($1^k 0^p 1^p$), contradicting condition c . Therefore, L cannot be regular.

- True or False: It is possible that the union of two regular languages is not regular.

False.