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

1. Write a regular expression over the alphabet { **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

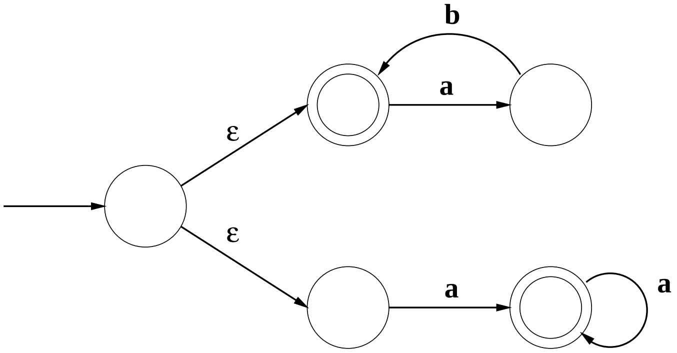
   $$/ * \Sigma^* * /$$

   .

2. 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.



3. Show the following language is non-regular:

   L = {w w | w 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 partioned into strings x, y, and z such that:

   (a) $|xy| \leq p$;

   (b) $|y| > 0$; and

   (c) $\forall i \geq 0$, $xy^i z \in L$.

   By conditions a and b, $y = 0^k$, where $0 < k \leq p$. However, $xy^3 z = 0^{p+2k} 1^p 0^p 1^p$ 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.

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

   False.