University of Ottawa **Winter 2005**
SITE

CSI 3104
MID-TERM EXAM

Professor: N. Zaguia

February 9, 2005, (16:00-17:20)

NAME:

STUDENT ID:

1. This is a closed-book exam. You can use this questionnaire for work. No books and no other papers are permitted. No electronic devices are allowed.
2. The answers for this test are to be written in the spaces provided. Use the backs of pages if extra space is required.

BONNE CHANCE! / GOOD LUCK!

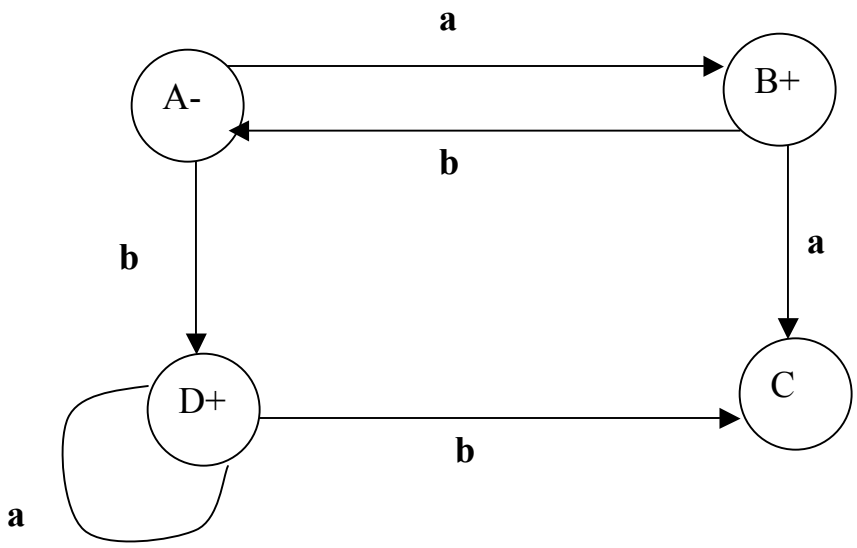
Question 1. [6 points]
Give a recursive definition for the set of strings of digits 0, 1, 2, 3, ...9 that cannot start with the digit 0 nor with the digit 1.

Question 2. [6 points]
Show whether or not the following two regular expressions define the same language:

(a+b)*ba(a+b)* + ab* and (a+b) (a+b)*

Question 3. [8 points] YOU DON'T HAVE TO EXPLAIN YOUR ANSWERS.

We consider the following transition graph T.



i) [4 points] Describe the language L accepted by T.

ii) [4 points] Using the description found in (i), give a regular expression corresponding to the language L.

Question 4. [10 points]
Let $\sum$ = {a, b}and let L be the language of all words on $\sum^*$ starting with ab.
For instance, the word **abbbabb** is in L, however **aabbaba** is not in L.

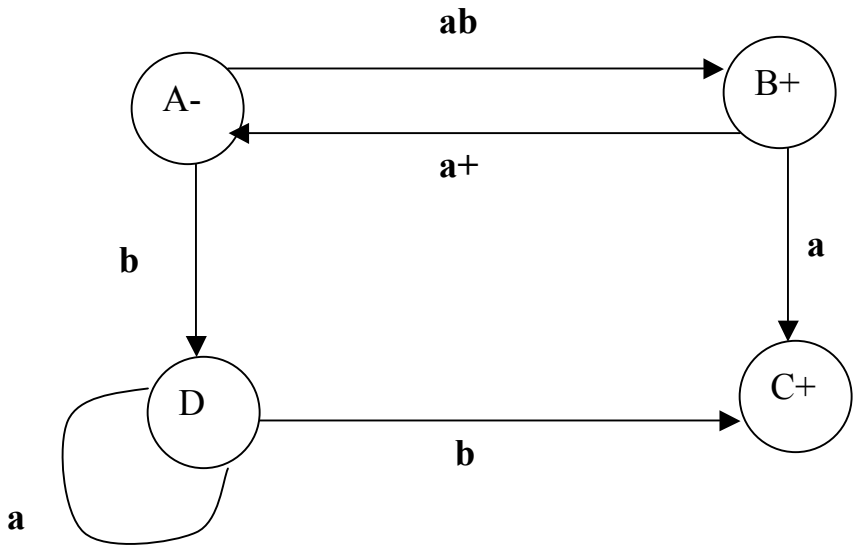
(i) [4 points] Construct a finite automaton for the language L.

(ii) [2 points] Give a regular expression corresponding to the language L.

(iii) [4 points] Describe (in English phrases) the language L corresponding to the regular expression

$$E= (b + \Lambda) (ab)^* (a +\Lambda)$$

Question 5. [6 points] Using the method seen in class (Proof of Kleene's theorem), give a regular expression for the language accepted by the following transition graph:



Question 5. [4 points]
Let L be a regular language on $\sum$ = {a, b}. Give an algorithm that will transform a transition graph for the language L into a new transition graph for the language complement of L. [EXPLAIN YOUR ANSWER]

[The complement L' of a language L is L'= $\sum^*$ - L]