

2 Give the formal definition of a Regular Expression.

Let  $\Sigma$  be a given alphabet. Then:

1.  $\emptyset$ ,  $\lambda$ , and  $a \in \Sigma$  are all regular expressions. These are called primitive regular expressions.
2. If  $r_1$  and  $r_2$  are regular expressions, so are  $r_1 + r_2$ ,  $r_1 \cdot r_2$ ,  $r_1^*$ , and  $(r_1)$ .
3. A string is a regular expression if and only if it can be derived from the primitive regular expressions by a finite number of applications of the rules in (2).

4 True or False: If  $L$  is a regular language, then every subset of  $L$  is also a regular language. Prove your answer.

This is false. For example, the language  $L = \{a, b\}^*$  is regular. The language  $L1 = \{a^n b^n\}$  is a subset of  $L$ , but it is not regular itself because it is infinite and cannot be represented by a DFA or NFA.