

Chapter 2

2.1

a. Strings over the alphabet $\{a, b, c\}$ where the first a precedes the first b .

$c^*a(a|c)^*b(a|b|c)^*$

b. Strings over the alphabet $\{a, b, c\}$ with an even number of a 's.

$((b|c)^*a(b|c)^*a(b|c)^*)^*$

c. Binary numbers that are multiples of four.

$(1|0)^*00$

d. Binary numbers that are greater than 101001.

$10101(0|1)$

$| 1011(0|1)(0|1)$

$| 11(0|1)(0|1)(0|1)(0|1)$

$| (0|1)^*1 (0|1)^*(0|1)(0|1)(0|1)(0|1)(0|1)(0|1)(0|1)$

e. Strings over the alphabet $\{a, b, c\}$ that don't contain the contiguous substring baa .

$(a|c)^*(b|bc(a|c)^*|ba|bac(a|c)^*)^*$

f. The language of nonnegative integer constants in C, where numbers beginning with 0 are octal constants and other numbers are decimal constants.

$(00|0[1-7][0-7]^*)|(0|[1-9][0-9]^*)$

g. Binary numbers n such that there exists an integer solution of $a^n + b^n = c^n$.

$1 | 10$ (费马大定理告诉我们大于2没有整数解 😊)

2.2 For each of the following, explain why you're not surprised that there is no regular expression defining it. (25分)

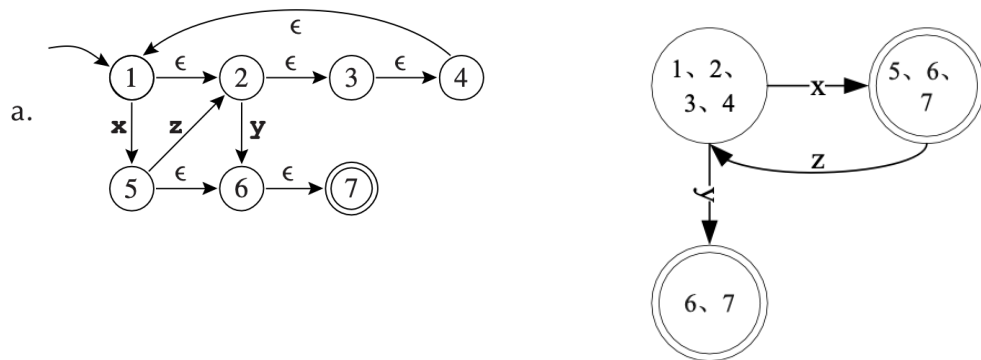
a. Strings of a 's and b 's where there are more a 's than b 's.

b. Strings of a 's and b 's that are palindromes (the same forward as backward).

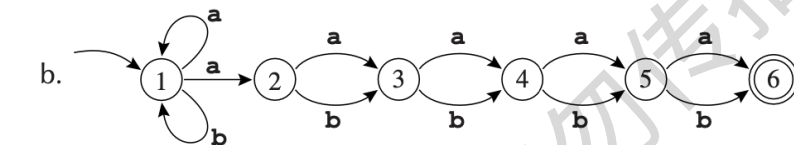
c. Syntactically correct C programs.

略

2.5 a



2.5 b



答案:

- {1} -a-> {2, 1}
- {1} -b-> {1}
- {2, 1} -a-> {2, 3, 1}
- {2, 1} -b-> {3, 1}
- {2, 3, 1} -a-> {4, 2, 3, 1}
- {2, 3, 1} -b-> {4, 3, 1}
- {3, 1} -a-> {4, 2, 1}
- {3, 1} -b-> {4, 1}
- {4, 1} -a-> {2, 5, 1}
- {4, 1} -b-> {5, 1}
- {4, 2, 3, 1} -a-> {4, 1, 5, 2, 3}
- {4, 2, 3, 1} -b-> {4, 1, 5, 3}
- {4, 2, 1} -a-> {1, 5, 2, 3}
- {4, 2, 1} -b-> {1, 5, 3}
- {4, 3, 1} -a-> {4, 2, 5, 1}
- {4, 3, 1} -b-> {4, 5, 1}
- {2, 5, 1} -a-> {2, 6, 3, 1}
- {2, 5, 1} -b-> {6, 3, 1}
- {4, 2, 5, 1} -a-> {6, 1, 5, 2, 3}

$\{4, 2, 5, 1\} -b-> \{1, 6, 5, 3\}$
 $\{4, 1, 5, 2, 3\} -a-> \{4, 6, 1, 5, 2, 3\}$
 $\{4, 1, 5, 2, 3\} -b-> \{4, 6, 1, 5, 3\}$
 $\{1, 5, 3\} -a-> \{4, 2, 6, 1\}$
 $\{1, 5, 3\} -b-> \{4, 6, 1\}$
 $\{5, 1\} -a-> \{2, 6, 1\}$
 $\{5, 1\} -b-> \{6, 1\}$
 $\{1, 5, 2, 3\} -a-> \{4, 6, 1, 2, 3\}$
 $\{1, 5, 2, 3\} -b-> \{4, 6, 3, 1\}$
 $\{4, 1, 5, 3\} -a-> \{4, 6, 1, 2, 5\}$
 $\{4, 1, 5, 3\} -b-> \{4, 6, 5, 1\}$
 $\{4, 5, 1\} -a-> \{2, 6, 5, 1\}$
 $\{4, 5, 1\} -b-> \{6, 5, 1\}$
 $\{1, 6, 5, 3\} -a-> \{4, 2, 6, 1\}$
 $\{1, 6, 5, 3\} -b-> \{4, 6, 1\}$
 $\{4, 6, 3, 1\} -a-> \{4, 2, 5, 1\}$
 $\{4, 6, 3, 1\} -b-> \{4, 5, 1\}$
 $\{6, 1, 5, 2, 3\} -a-> \{4, 6, 1, 2, 3\}$
 $\{6, 1, 5, 2, 3\} -b-> \{4, 6, 3, 1\}$
 $\{4, 6, 1, 5, 3\} -a-> \{4, 6, 1, 2, 5\}$
 $\{4, 6, 1, 5, 3\} -b-> \{4, 6, 5, 1\}$
 $\{4, 6, 1, 5, 2, 3\} -a-> \{4, 6, 1, 5, 2, 3\}$
 $\{4, 6, 1, 5, 2, 3\} -b-> \{4, 6, 1, 5, 3\}$
 $\{2, 6, 1\} -a-> \{2, 3, 1\}$
 $\{2, 6, 1\} -b-> \{3, 1\}$
 $\{6, 1\} -a-> \{2, 1\}$
 $\{6, 1\} -b-> \{1\}$
 $\{4, 2, 6, 1\} -a-> \{1, 5, 2, 3\}$
 $\{4, 2, 6, 1\} -b-> \{1, 5, 3\}$
 $\{4, 6, 5, 1\} -a-> \{2, 6, 5, 1\}$
 $\{4, 6, 5, 1\} -b-> \{6, 5, 1\}$
 $\{4, 6, 1, 2, 5\} -a-> \{6, 1, 5, 2, 3\}$
 $\{4, 6, 1, 2, 5\} -b-> \{6, 3, 5, 1\}$
 $\{6, 3, 1\} -a-> \{4, 2, 1\}$
 $\{6, 3, 1\} -b-> \{4, 1\}$
 $\{2, 6, 3, 1\} -a-> \{4, 2, 3, 1\}$
 $\{2, 6, 3, 1\} -b-> \{4, 3, 1\}$
 $\{4, 6, 1\} -a-> \{2, 5, 1\}$

$\{4, 6, 1\} \xrightarrow{-b} \{5, 1\}$
 $\{4, 6, 1, 2, 3\} \xrightarrow{-a} \{4, 1, 5, 2, 3\}$
 $\{4, 6, 1, 2, 3\} \xrightarrow{-b} \{4, 3, 5, 1\}$
 $\{2, 6, 5, 1\} \xrightarrow{-a} \{2, 6, 3, 1\}$
 $\{2, 6, 5, 1\} \xrightarrow{-b} \{6, 3, 1\}$
 $\{6, 5, 1\} \xrightarrow{-a} \{2, 6, 1\}$
 $\{6, 5, 1\} \xrightarrow{-b} \{6, 1\}$

2.6 (25分)

