1. 使用 Thompson 构造法为下列正规式构造 NFA，写出每个 NFA 处理符号串 “ababbab” 过程中的状态转换序列。

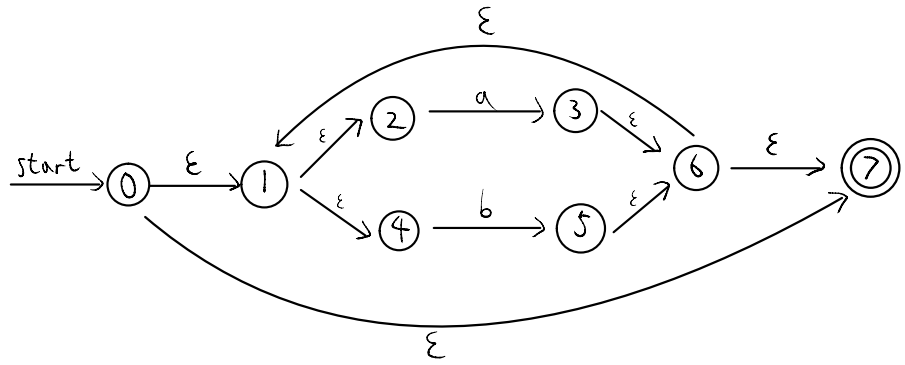
   (a) (a|b)*

   (b) (a*|b*)*

   (c) ((ε|a)b*)*

   (d) (a|b)*abb(a|b)*

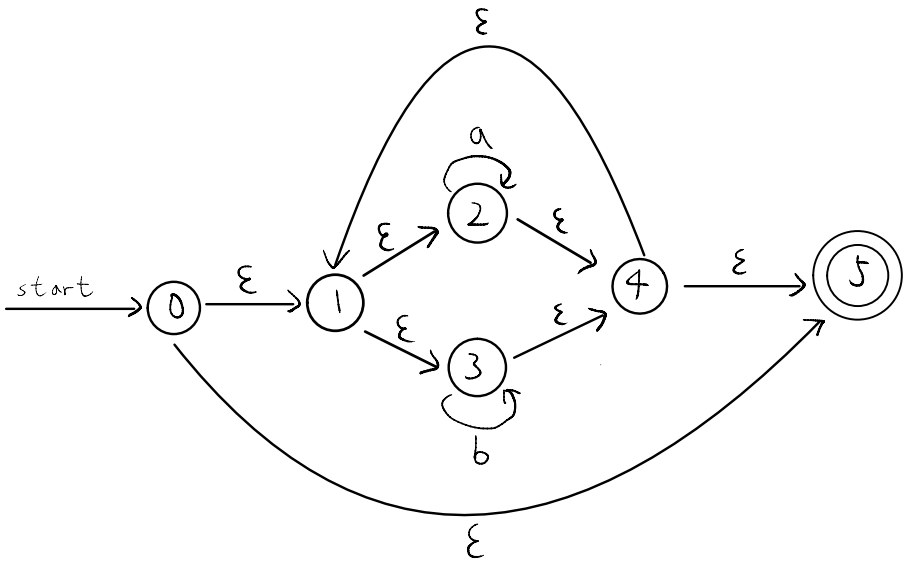
(a) (a|b)*



0 1 2 3 6 1 4 5 6 1 2 3 6 1 4 5 6 1 4 5 6 1 2 3 6 1 4 5 6 7

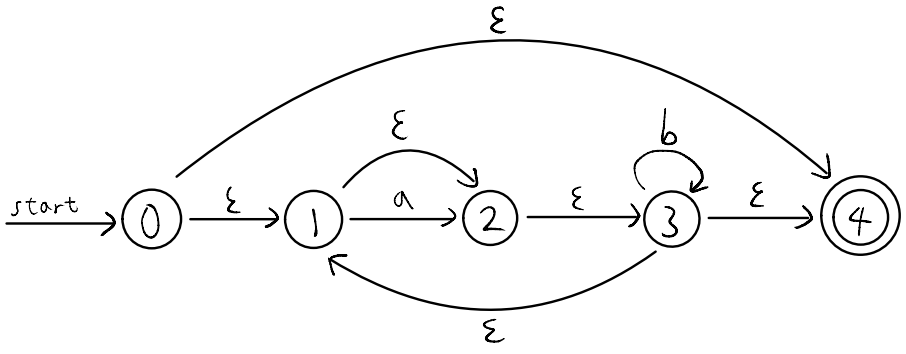
a b a b b a b

(b) (a*|b*)*



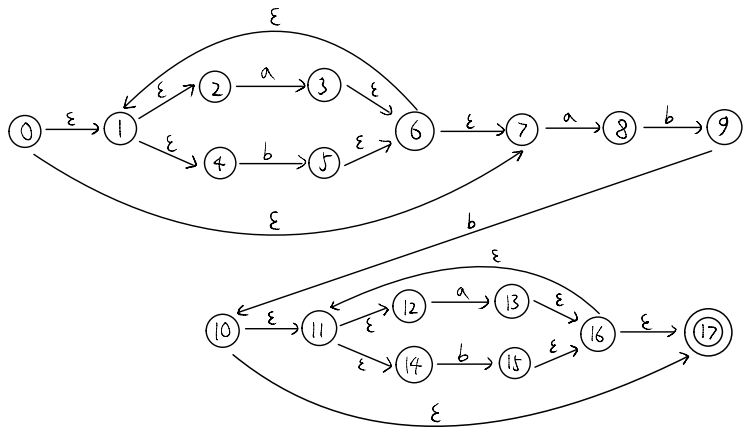
0 1 2 2 4 1 3 3 4 1 2 2 4 1 3 3 3 4 1 2 2 4 1 3 3 4
a b a b b a b

(c) ((ε|a)b*)*



0 1 2 3 3 1 2 3 3 1 2 3 3 4
a b a b b a b

(d) (a|b)*abb(a|b)*



0 1 2 3 6 1 4 5 6 7 8 9 10 11 12 13 16 11 14 15 16 17

a b a b b a b

2. 利用子集构造法将第一题得到的 NFA 转换为 DFA，同样写出分析符号串“ababbab”过程中的状态转换。

(a) (a|b)*

S_0 : 0 1 2 4 7 —a→ 3 6 7 1 2 4 : S_1

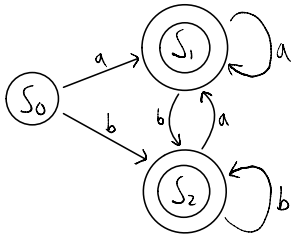
—b→ 5 6 7 1 2 4 : S_2

S_1 : 3 6 7 1 2 4 —a→ 3 6 7 1 2 4 : S_1

—b→ 5 6 7 1 2 4 : S_2

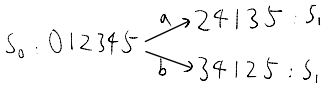
S_2 : 5 6 7 1 2 4 —a→ 3 6 7 1 2 4 : S_1

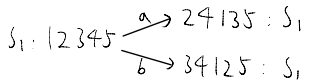
—b→ 5 6 7 1 2 4 : S_2

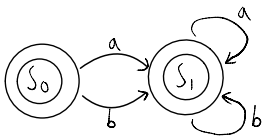


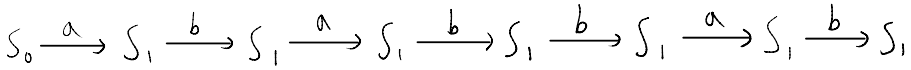
$S_0 \xrightarrow{a} S_1 \xrightarrow{b} S_2 \xrightarrow{a} S_1 \xrightarrow{b} S_2 \xrightarrow{b} S_2 \xrightarrow{a} S_1 \xrightarrow{b} S_2$

(b) (a*|b*)*

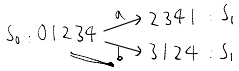


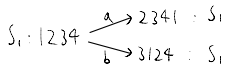


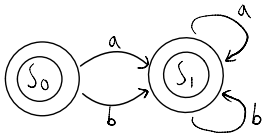


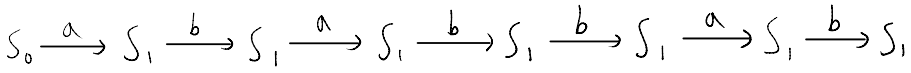


(c) ((ε|a)b*)*









(d) (a|b)*abb(a|b)*

$S_0: 01247 \xrightarrow{a} 361247 : S_1$

$\xrightarrow{b} 561247 : S_2$

$S_1: 361247 \xrightarrow{a} 3612478 : S_3$

$\xrightarrow{b} 561247 : S_2$

$S_2: 561247 \xrightarrow{a} 3612478 : S_3$

$\xrightarrow{b} 561247 : S_2$

$S_3: 3612478 \xrightarrow{a} 3612478 : S_3$

$\xrightarrow{b} 5612479 : S_4$

$S_4: 5612479 \xrightarrow{a} 3612478 : S_3$

$\xrightarrow{b} 561247\ 10\ 11\ 12\ 14\ 17 : S_5$

$S_5: S_2+\ 10\ 11\ 12\ 14\ 17 \xrightarrow{a} S_3+\ 13\ 16\ 11\ 12\ 14\ 17 : S_6$

$\xrightarrow{b} S_2+\ 15\ 16\ 11\ 12\ 14\ 17 : S_7$

$S_6: S_3+\ 13\ 16\ 11\ 12\ 14\ 17 \xrightarrow{a} S_3+\ 13\ 16\ 11\ 12\ 14\ 17 : S_6$

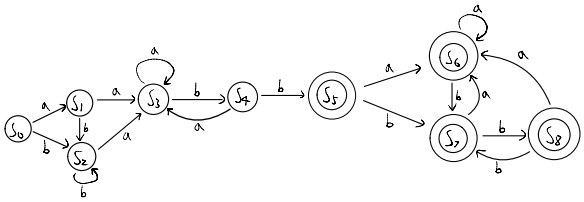
$\xrightarrow{b} S_4+\ 15\ 16\ 11\ 12\ 14\ 17 : S_7$

$S_7: S_4+15\cdots \xrightarrow{a} S_3+13\cdots : S_6$

$\xrightarrow{b} S_5+15\cdots : S_8$

$S_8: S_5+15\cdots \xrightarrow{a} S_6+13\cdots = S_6$

$\xrightarrow{b} S_7+15\cdots = S_7$



$S_0 \xrightarrow{a} S_1 \xrightarrow{b} S_2 \xrightarrow{a} S_3 \xrightarrow{b} S_4 \xrightarrow{b} S_5 \xrightarrow{a} S_6 \xrightarrow{b} S_7$