

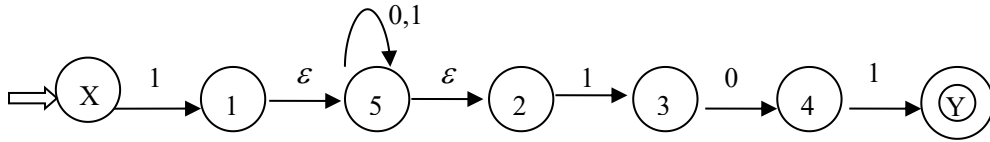
### 第3章 词法分析

7. 构造下列正规式相应的 DFA:

(1)  $1(0|1)^*101$

解:

(1) 构造 NFA:



(2) 确定化:

构造状态转换矩阵如下:

I	I0	I1
{X}	-	{1, 5, 2}
{1, 5, 2}	{5, 2}	{5, 3, 2}
{5, 2}	{5, 2}	{5, 3, 2}
{5, 3, 2}	{5, 4, 2}	{5, 3, 2}
{5, 4, 2}	{5, 2}	{5, Y, 3, 2}
{5, Y, 3, 2}	{5, 4, 2}	{5, 3, 2}

重命名:

S	0	1
0	-	1
1	2	3
2	2	3
3	4	3
4	2	5
5	4	3

(3) 化简

分组  $\{0, 1, 2, 3, 4\}$   $\{5\}$

考察  $\{0, 1, 2, 3, 4\}_0 = \{2, 4\}$   $\{0, 1, 2, 3, 4\}_1 = \{1, 3, 5\}$

$\therefore$  分化为:  $\{0, 1, 2, 3\}$ 、 $\{4\}$ 、 $\{5\}$

再考察:  $\{0, 1, 2, 3\}_0 = \{2, 4\}$

$\therefore$  分化为:  $\{0, 1, 2, \}$ 、 $\{3\}$ 、 $\{4\}$ 、 $\{5\}$

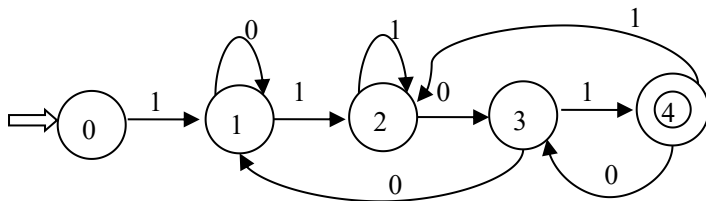
再考察:  $\{0, 1, 2\}_0 = \{2\}$   $\{0, 1, 2\}_1 = \{1, 3\}$

$\therefore$  分化为:  $\{0\}$ 、 $\{1, 2, \}$ 、 $\{3\}$ 、 $\{4\}$ 、 $\{5\}$

(4) 化简之后的状态表

S	0	1
0	-	1
1	1	2
2	3	2
3	1	4
4	3	2

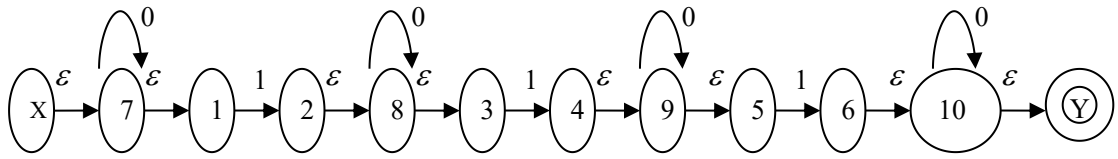
(5) 画出状态转换图:



(3)  $0^*10^*10^*10^*$

解:

(1) 构造 NFA:



(2) 确定化:

构造状态转换矩阵如下:

I	I0	I1
{X, 7, 1}	{7, 1}	{2, 8, 3}
{7, 1}	{7, 1}	{2, 8, 3}
{2, 8, 3}	{8, 3}	{4, 9, 5}
{8, 3}	{8, 3}	{4, 9, 5}
{4, 9, 5}	{9, 5}	{6, 10, Y}
{9, 5}	{9, 5}	{6, 10, Y}
{6, 10, Y}	{10, Y}	--
{10, Y}	{10, Y}	--

重命名:

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

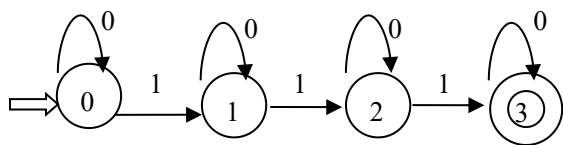
(3) 化简

如上表所示: {0, 1}、{2, 3}、{4, 5}、{6, 7}

化简后的状态表为:

S	0	1
0	0	1
1	1	2
2	2	3
3	3	-

(4) 最简 DFA 状态转换图



8. (1)  $(0|1)^*01$

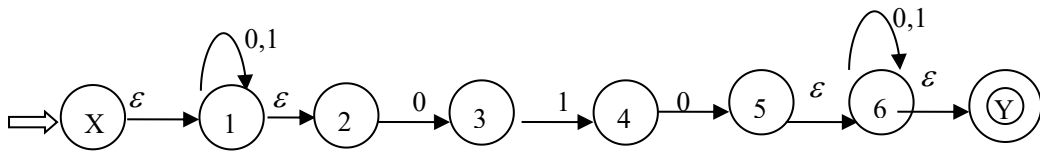
(2)  $\Sigma = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

- $((1|2|3|4|5|6|7|8|9) \Sigma^*(0|5)) | (0|5)$   
 (3)  $1^*0((01^*0) | 1)^* | 0^*1((10^*1) | 0)^*$   
 (4)  $a^*b^*c^* \dots z^*$   
 (5)  $(x_0 | \varepsilon)(x_1 | \varepsilon)(x_2 | \varepsilon) \dots (x_9 | \varepsilon) \quad \Sigma = \{0, 1, \dots, 9\}$   
 其中  $x_0 \in \Sigma \quad x_i \in \Sigma - \{x_0, \dots, x_{i-1}\} \quad i=1, \dots, 9$   
 (6)  $(x_0 | \varepsilon)y_0(x_1 | \varepsilon)y_1(x_2 | \varepsilon)y_2 \dots (x_9 | \varepsilon)y_9$   
 其中  $x_0 \in \Sigma \quad x_i \in \Sigma - \{x_0, \dots, x_{i-1}\} \quad i=1, \dots, 9$   
 如果  $y_m \neq \varepsilon$ , 则  $y_n = \varepsilon \quad (m=0, \dots, 9) \quad (n=0, 1, \dots, m-1, m+1, \dots, 9)$   
 其中  $y_0, \dots, y_9 \in \{\varepsilon, 0, 1, \dots, 9\}$   
 (7)  $b^*(a | ab)^*$

9.

(1) 正规式  $(0|1)^*(010)(0|1)^*$

① NFA:



②

构造状态转换矩阵:

I	I0	I1
{X, 1, 2}	{1, 3, 2}	{1, 2}
{1, 3, 2}	{1, 3, 2}	{1, 4, 2}
{1, 2}	{1, 3, 2}	{1, 2}
{1, 4, 2}	{1, 5, 3, 2, 6, Y}	{1, 2}
{1, 5, 3, 2, 6, Y}	{1, 3, 6, 2, Y}	{1, 4, 6, 2, Y}
{1, 3, 6, 2, Y}	{1, 3, 6, 2, Y}	{1, 4, 6, 2, Y}
{1, 4, 6, 2, Y}	{1, 5, 3, 2, 6, Y}	{1, 6, 2, Y}
{1, 6, 2, Y}	{1, 3, 6, 2, Y}	{1, 6, 2, Y}

重命名:

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

③ 最小化

④ 化简后的状态表

S	0	1
0	1	0
1	1	2
2	3	0
3	3	3

分组:  $\{0, 1, 2, 3\}$ 、 $\{4, 5, 6, 7\}$

考察:  $\{0, 1, 2, 3\}_0 = \{1, 4\}$

$\therefore$  分化为  $\{0, 1, 2\}$ 、 $\{3\}$ 、 $\{4, 5, 6, 7\}$

再考察:  $\{0, 1, 2\}_0 = \{1\} \quad \{0, 1, 2\}_1 = \{2, 3\}$

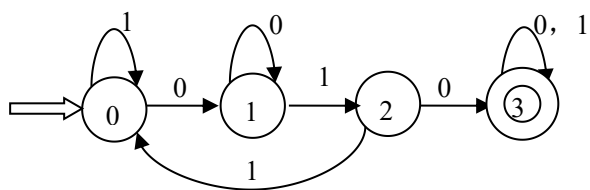
$\therefore$  分化为  $\{0, 2\}$ 、 $\{1\}$ 、 $\{3\}$ 、 $\{4, 5, 6, 7\}$

再考察:  $\{4, 5, 6, 7\}_0 = \{4, 5\} \quad \{4, 5, 6, 7\}_1 = \{6, 7\}$

$\therefore$  分化为  $\{0, 2\}$ 、 $\{1\}$ 、 $\{3\}$ 、 $\{4, 5, 6, 7\}$

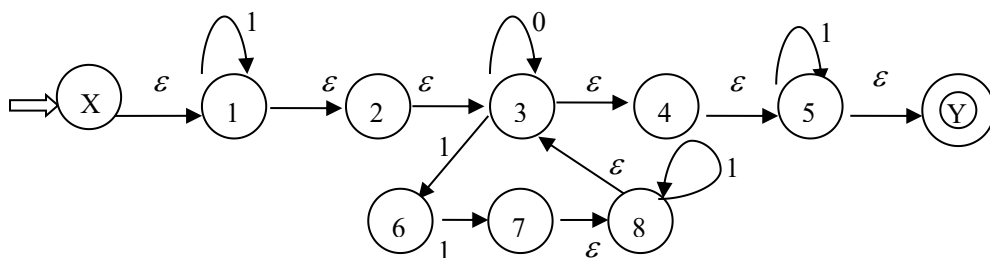
再重新命名为:  $\{0, 2\} \rightarrow 0$ 、 $\{1\} \rightarrow 1$ 、 $\{3\} \rightarrow 2$ 、 $\{4, 5, 6, 7\} \rightarrow 3$

最小化后的状态转换图为:



(2) 正规式  $1^*(0 | 11 | 111)^*1^*$  或  $1^*(0 | 111^*)^*1^*$

① NFA:



②

构造状态转换矩阵:

重命名:

I	I0	I1
{X, 1, 2, 3, 4, 5, Y}	{3, 4, 5, Y}	{1, 6, 5, 2, 3, 4, Y}
{3, 4, 5, Y}	{3, 4, 5, Y}	{6, 5, Y}
{1, 2, 3, 4, 5, 6, Y}	{3, 4, 5, Y}	{1, 6, 5, 7, 2, 3, 4, Y, 8}
{6, 5, Y}	---	{5, 7, Y, 8, 3, 4}
{1, 2, 3, 4, 5, 6, 7, 8, Y}	{3, 4, 5, Y}	{1, 6, 5, 7, 8, 2, 3, 4, Y}
{3, 4, 5, 7, 8, Y}	{3, 4, 5, Y}	{6, 5, 8, Y, 3, 4}
{3, 4, 5, 6, 8, Y}	{3, 4, 5, Y}	{6, 5, 7, 8, Y, 3, 4}
{3, 4, 5, 6, 7, 8, Y}	{3, 4, 5, Y}	{6, 5, 7, 8, Y, 3, 4}

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

③ 最小化

④ 化简后的状态表

分组: {0,1,2,4,5,6,7}、{3}

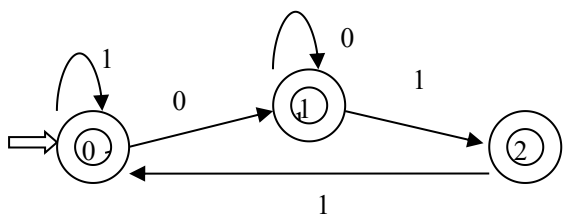
考察: {0,1,2,4,5,6,7}<sub>0</sub>={1} {0,1,2,4,5,6,7}<sub>1</sub>={2,3,4,6,7}

∴ 分化为 {0,2,4,5,6,7}、{1}、{3}

再重新命名为: {0,2,4,5,6,7}—0、{1}—1、{3}—2

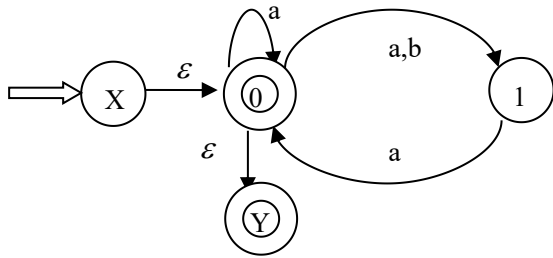
S	0	1
0	1	0
1	1	2
2	-	0

最小化后的状态转换图为:



12.

(a)



构造状态转换矩阵:

I	Ia	Ib
{X,0,Y}	{0,1,Y}	{1}
{0,1,Y}	{0,1,Y}	{1}
{1}	{0,Y}	—
{0,Y}	{0,1,Y}	{1}

重命名:

S	a	b
0	1	2
1	1	2
2	3	—
3	1	2

化简:

分化为: {0,1,3}、{2}

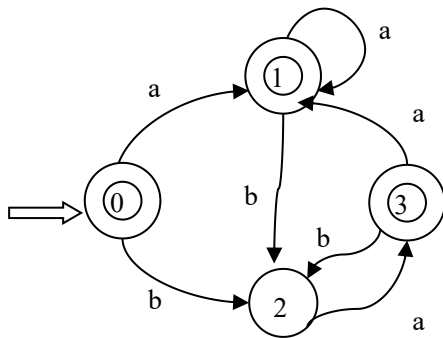
考察: {0,1,3}a = {1}    {0,1,3}b = {2}

∴ 分化为: {0,1,3}、{2}

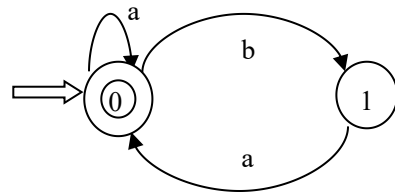
重命名后的状态表:

S	a	b
0	0	1
1	0	—

画出确定化后的有限自动机:



最小化的有限自动机:



(b) 最少化: 首先分为终态集和非终态集: {0, 1}、{2, 3, 4, 5}

{0, 1}a={1}

{0, 1}b={2, 4}

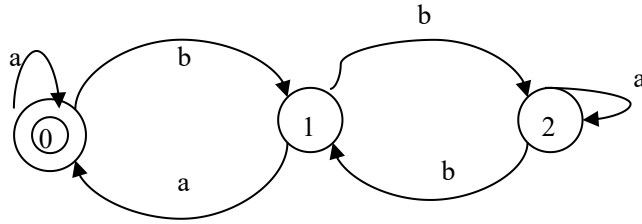
{2, 3, 4, 5}a={1, 3, 0, 5} 可分为{2, 4}和{3, 5}

{2, 4}b={3, 5}

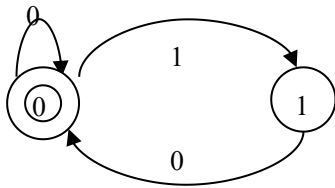
{3, 5}b={2, 4}

形成划分: {0, 1}{2, 4}{3, 5}

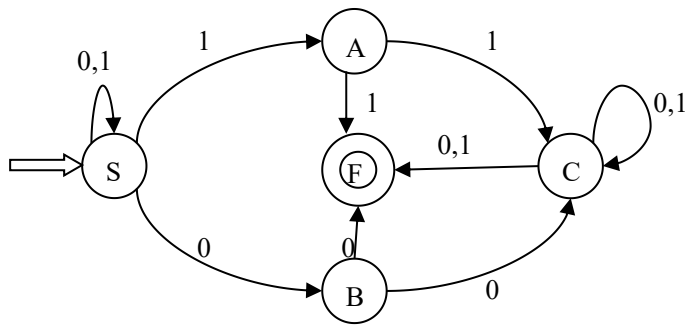
最少化后的 DFA:



14. 每个 1 都有 0 直接跟在右边：  
 $(10|0)^*$



15. 画出 NFA:



等价的左线性正规文法:

$F \rightarrow A1|B0|C0|C1$

$S \rightarrow 0|1|S0|S1$

$A \rightarrow 1|S1$

$B \rightarrow 0|S0$

$C \rightarrow A1|B0|C0|C1$