1. 请给出集合 $\{\varepsilon, \Phi, \{\Phi\}, \{\Phi, \Phi\}\}$ 的幂集。

解：

幂集：$\{\Phi, \{\varepsilon\}, \{\Phi\}, \{\{\Phi\}\}, \{\Phi, \Phi\}, \{\varepsilon, \Phi\}, \{\varepsilon, \{\Phi\}\}$,

$\{\varepsilon, \{\Phi, \Phi\}\}, \{\Phi, \{\Phi\}\}, \{\Phi, \Phi, \Phi\}$,

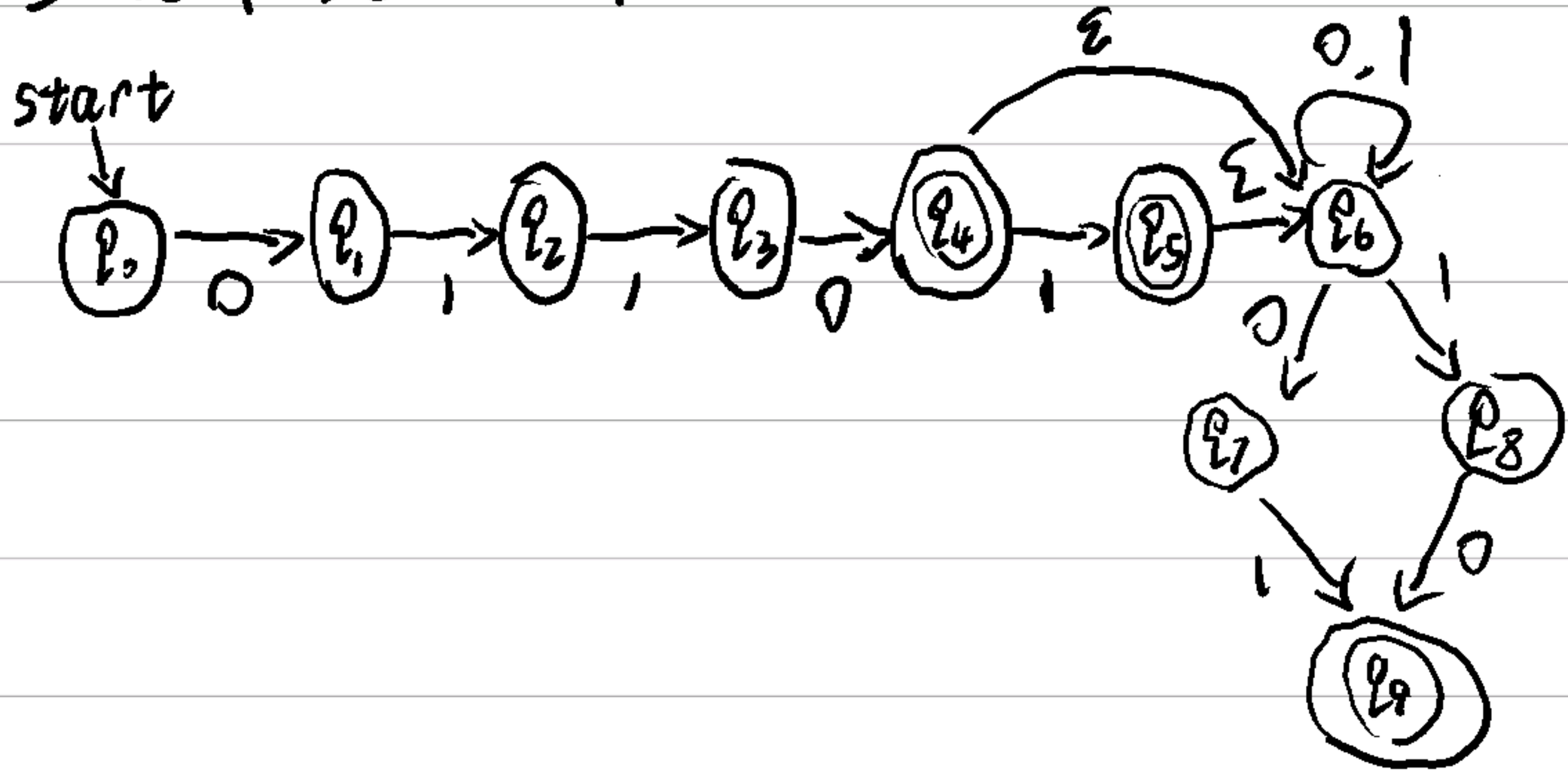
$\{\{\Phi\}, \{\Phi, \Phi\}\}, \{\varepsilon, \Phi, \{\Phi\}\}, \{\varepsilon, \Phi, \{\Phi, \Phi\}\}$,

$\{\varepsilon, \{\Phi\}, \{\Phi, \Phi\}\}, \{\Phi, \{\Phi\}, \{\Phi, \Phi\}\}$,

$\{\varepsilon, \Phi, \{\Phi\}, \{\Phi, \Phi\}\}\}$

2. 请构造识别语言“由 0 和 1 组成、以 0110 开头且以 01 或 10 结尾的字符串（包含 0110）”的 DFA。

解：① 先构造 ε-NFA：



② 将其转换成等价的DFA

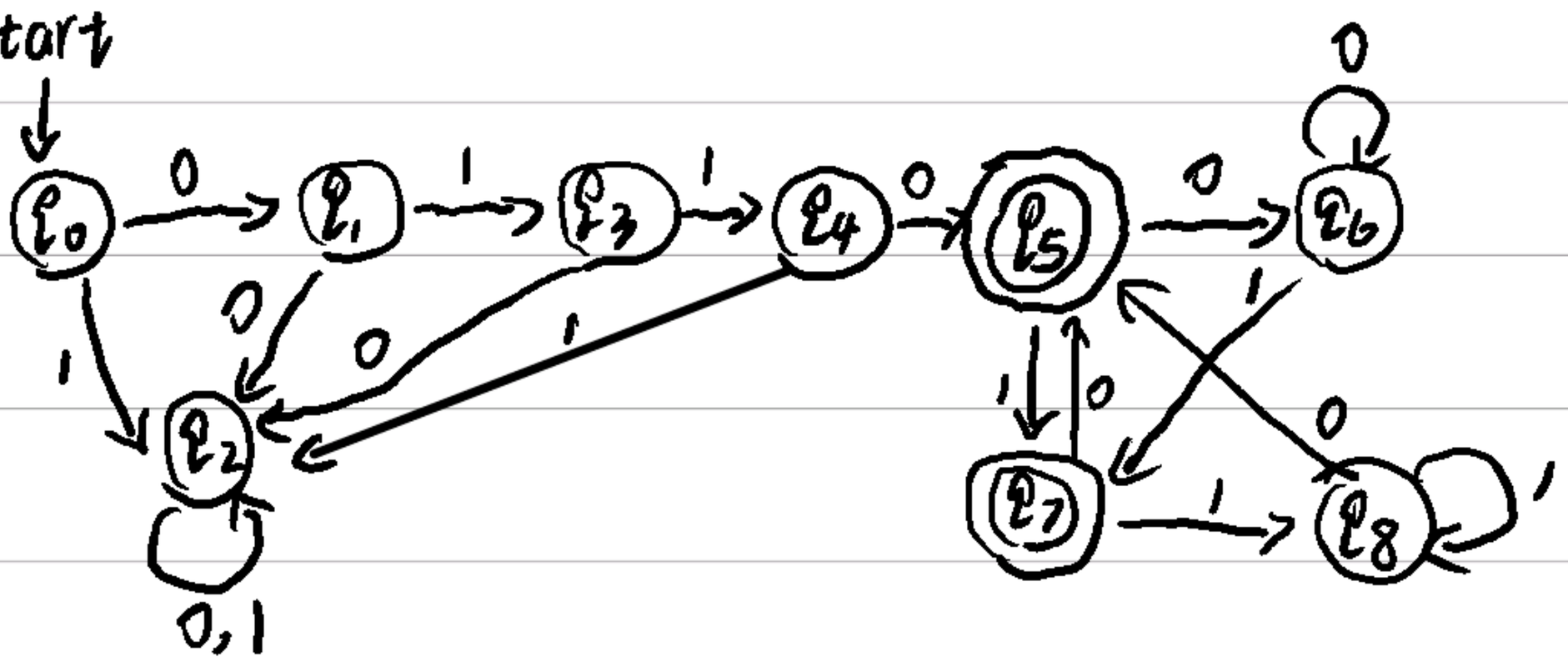
状态转移表为：

	0	1
→{q0}	{q1}	∅
{q1}	∅	{q2}
∅	∅	∅
{q2}	∅	{q3}
{q3}	{q4, q6}	∅
*{q4, q6}	{q6, q7}	{q5, q6, q8}
{q6, q7}	{q6, q7}	{q6, q8, q9}
*{q5, q6, q8}	{q6, q7, q9}	{q6, q8}
*{q6, q8, q9}	{q6, q7, q9}	{q6, q8}
*{q6, q7, q9}	{q6, q7}	{q6, q8, q9}
{q6, q8}	{q6, q7, q9}	{q6, q8}

化简后的状态转移表等价于：

	0	1
q_0	q_1	q_2
q_1	q_2	q_3
q_2	q_2	q_2
q_3	q_2	q_4
q_4	q_5	q_2
*q_5	q_6	q_7
q_6	q_6	q_7
*q_7	q_5	q_8
q_8	q_5	q_8

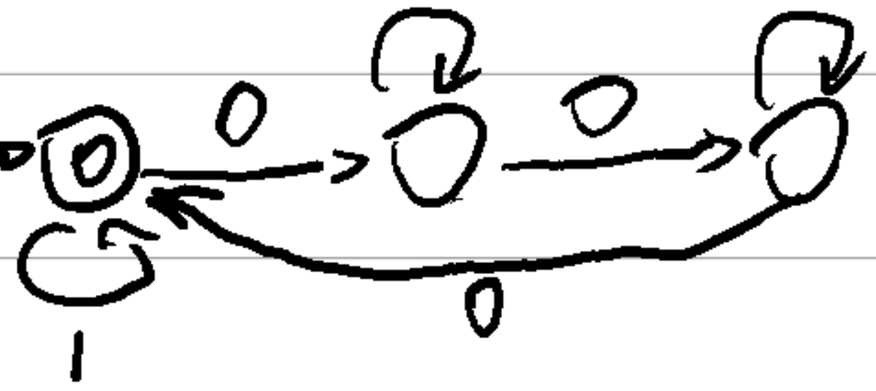
根据化简后的DFA状态表得DFA状态转移图为：



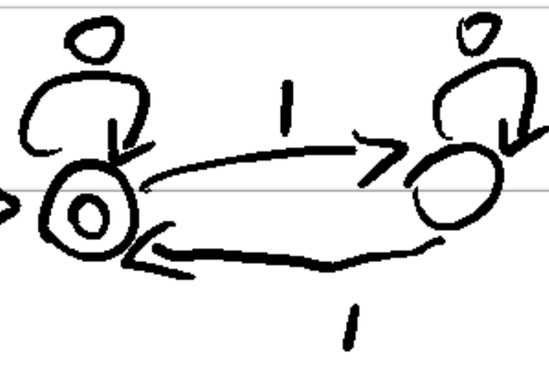
3. 请构造识别语言“由 0 和 1 组成、0 的个数被 3 整除，1 的个数被 2 整除的字符串”的 DFA。

解：①先分别构造两个DFA：

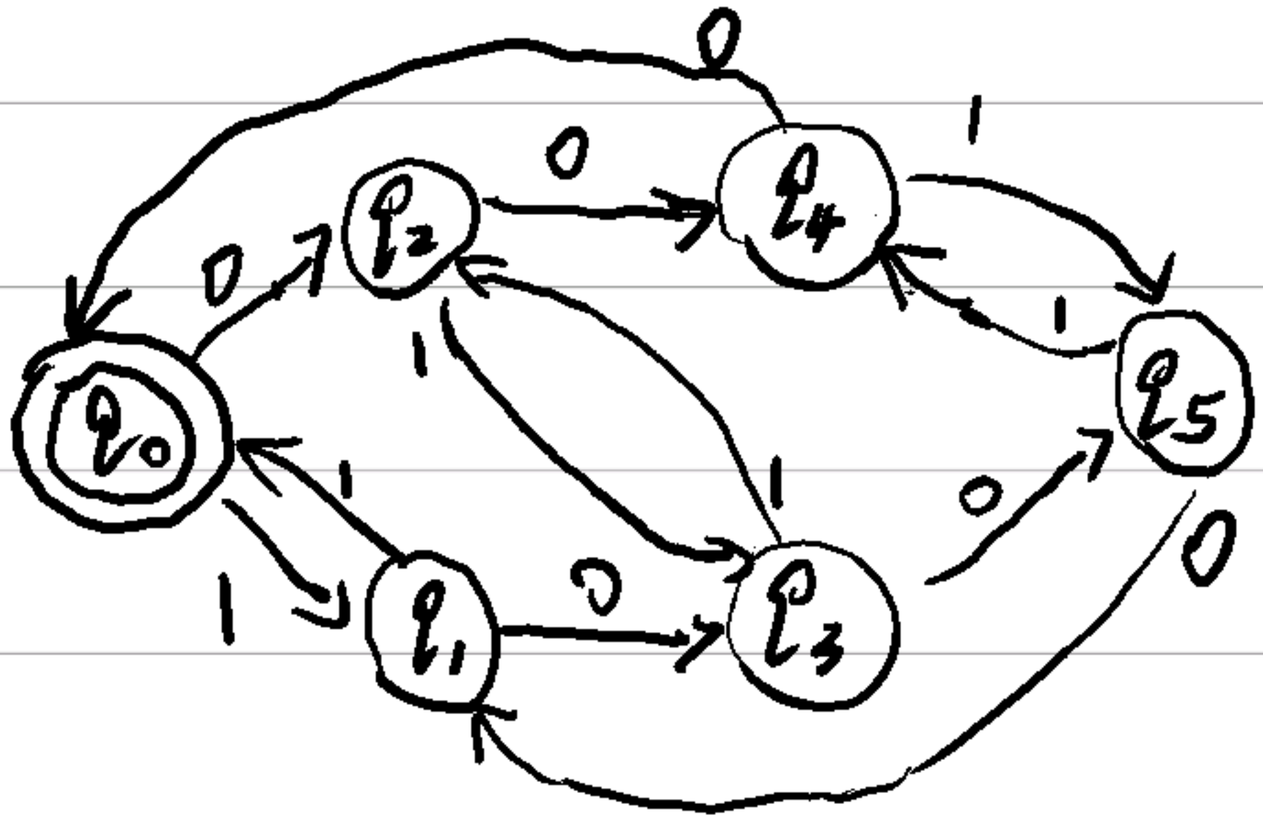
0的个数被3整除：start →



1的个数被2整除：start →



②将两个DFA做笛卡尔积：



即为本题所要求的DFA