1f.pdf

1.1 (a) M_1, M_2 的起始状态是各自的 q_1

(b) M_1 的接受状态：$\{q_2\}$，M_2 的接受状态：$\{q_1, q_4\}$

(c) M_1：$q_1 \xrightarrow{a} q_2 \xrightarrow{a} q_3 \xrightarrow{b} q_1 \xrightarrow{b} q_1$

M_2：$q_1 \xrightarrow{a} q_1 \xrightarrow{a} q_1 \xrightarrow{b} q_2 \xrightarrow{b} q_4$

(d) M_1 不接受，M_2 接受。

1.2 M_1 的形式化描述：

$Q = \{q_1, q_2, q_3\}$

$\Sigma = \{a, b\}$

start state $= q_1$

$F = \{q_2\}$

$\delta(q_1, a) = q_2$

$\delta(q_1, b) = q_1$

$\delta(q_2, a) = q_3$

$\delta(q_2, b) = q_3$

$\delta(q_3, a) = q_2$

$\delta(q_3, b) = q_1$

M_2 的形式化描述：

$Q = \{q_1, q_2, q_3, q_4\}$

$\Sigma = \{a, b\}$

start state $= q_1$

$F = \{q_2, q_4\}$

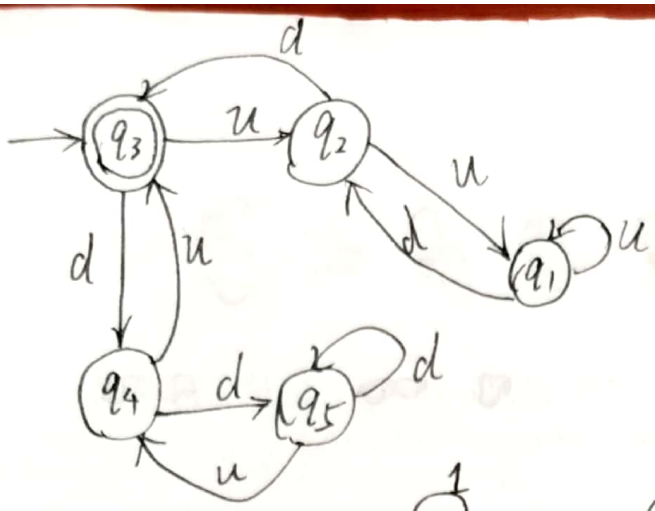
$\delta(q_1, a) = q_1$　$\delta(q_1, b) = q_2$

$\delta(q_2, a) = q_3$　$\delta(q_2, b) = q_4$

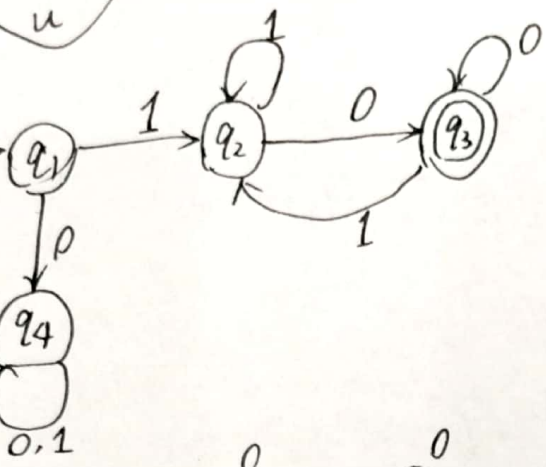
$\delta(q_3, a) = q_2$，$\delta(q_3, b) = q_1$

$\delta(q_4, a) = q_3$，$\delta(q_4, b) = q_4$。

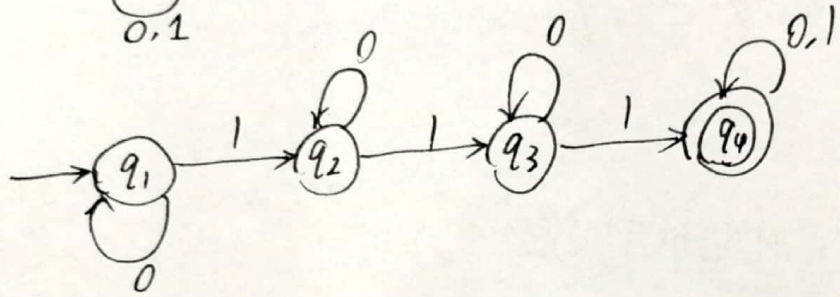
1.3



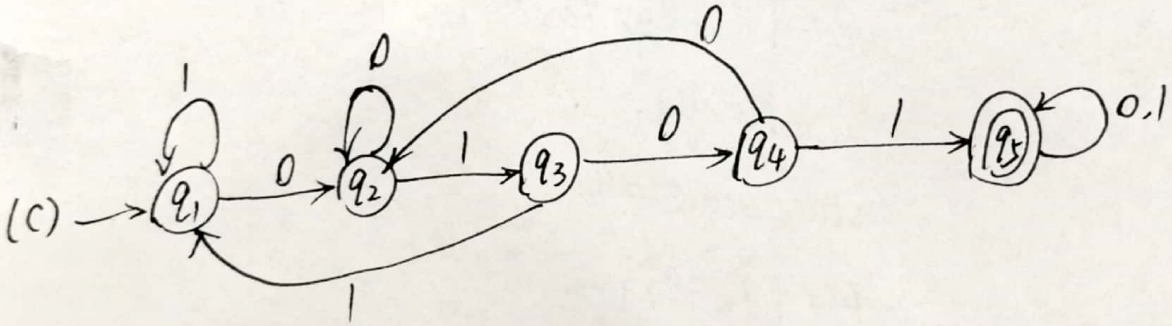
1.6 (a)



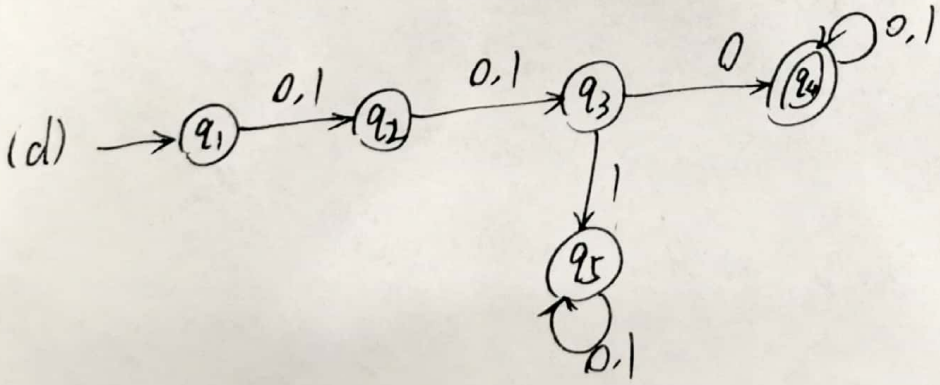
(b)



(c)



(d)



2f. pdf

a. Compute the complete truth table of the formula:

(1) $((p \to q) \to p) \to p$

p	q	$p \to q$	$(p \to q) \to p$	$((p \to q) \to p) \to p$
T	T	T	T	T
T	F	F	T	T
F	T	T	F	T
F	F	T	F	T

(2) $(p \wedge q) \to (p \vee q)$

p	q	$p \wedge q$	$p \vee q$	$(p \wedge q) \to (p \vee q)$
T	T	T	T	T
T	F	F	T	T
F	T	F	T	T
F	F	F	F	T

(3) $(p \to q) \vee (p \to \neg q)$

$\neg q$	p	q	$p \to q$	$p \to \neg q$	$(p \to q) \vee (p \to \neg q)$
F	T	T	T	F	T
T	T	F	F	T	T
F	F	T	T	T	T
T	F	F	T	T	T

(4) $((p \vee q) \to r) \to ((p \to r) \vee (q \to r))$

p	q	r	$p \vee q$	$(p \vee q) \to r$	$p \to r$	$q \to r$	$(p \to r) \vee (q \to r)$	$((p \vee q) \to r) \to ((p \to r) \vee (q \to r))$
T	T	T	T	T	T	T	T	T
T	T	F	T	F	F	F	F	T
T	F	T	T	T	T	T	T	T
T	F	F	T	F	F	T	T	T
F	T	T	T	T	T	T	T	T
F	T	F	T	F	T	F	T	T
F	F	T	F	T	T	T	T	T
F	F	F	F	T	T	T	T	T

1. (a) $\forall x (P(x) \to A(m,x))$

(b) $\exists x (P(x) \wedge A(x,m))$

(c) $A(m,m)$

(d) ~~$\neg\exists x (S(x) \wedge \forall y$~~

Student x attended every lecture: $S(x) \wedge \forall y (L(y) \to B(x,y))$

$\neg\exists x (S(x) \wedge \forall y (L(y) \to B(x,y)))$

(e) Lecture y was attended by every student: $L(y) \wedge \forall x (P(x) \to B(x,y))$

$\neg\exists y (L(y) \wedge \forall x (P(x) \to B(x,y)))$

(f) Lecture y was not attended by any student: $\neg\exists x (P(x) \wedge B(x,y))$

$\forall y (\neg\exists x (P(x) \wedge B(x,y)))$

2. (a) 将 P^M $\underline{def}$ $\{(m,n) \mid m<n\}$ 代入 ϕ, ϕ 变成 $\forall x \exists y \exists z (x<y \wedge z<y \wedge (x<z \to z<x))$

可满足, 对于任意的自然数 x, 取 $y=x+1$, $z=x$ 就可使 ϕ 得到满足

(b) 将 $P^{M'}$ $\underline{def}$ $\{(m, 2*m) \mid m$ natural number$\}$ 代入 ϕ.

$\phi = \forall x \exists y \exists z (y=2x \wedge y=2z \wedge (z=2x \to x=2z))$

可满足. 对于任意的自然数 x, 取 $y=2x$, $z=x$ 就可使 ϕ 得到满足.

(c) 将 $P^{M''}$ 代入 ϕ, $\phi = \forall x \exists y \exists z (x<y+1 \wedge z<y+1 \wedge (x<z+1 \to z<x+1))$

可满足. 对于任意的自然数 x, 取 $y=x$, $z=x$ 就可使 ϕ 得到满足.