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 $=q_1$

$F=\{q_1, q_4\}$

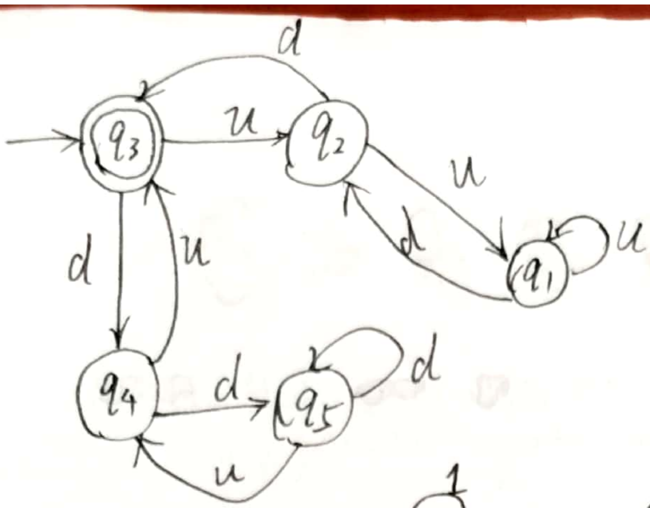
$\delta(q_1, a)=q_1$ $\delta(q_1, b)=q_2$

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

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

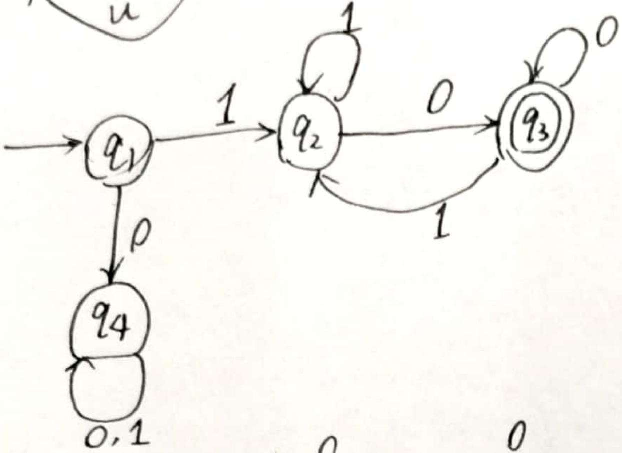
$\delta(q_4, a)=q_3$, $\delta(q_4, b)=q_4$.

1.3



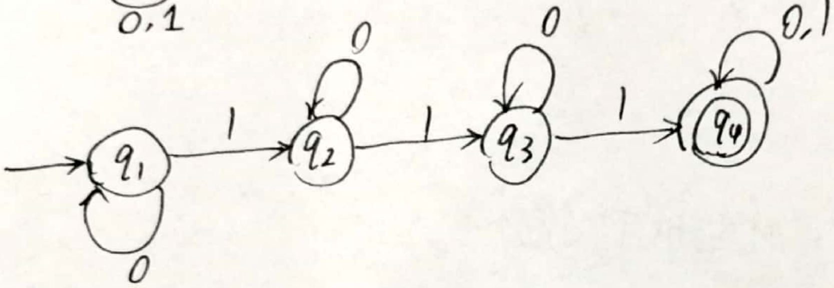
q3
q2
q1
q4
q5
u
d

1.6 (a)



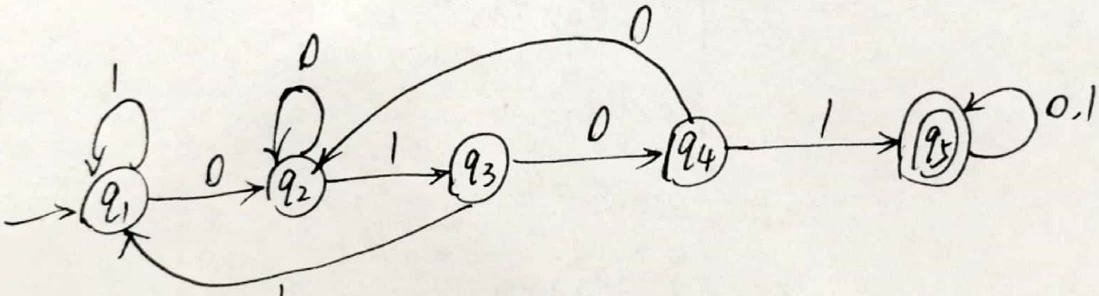
q1
q2
q3
q4
0
1
0,1

(b)



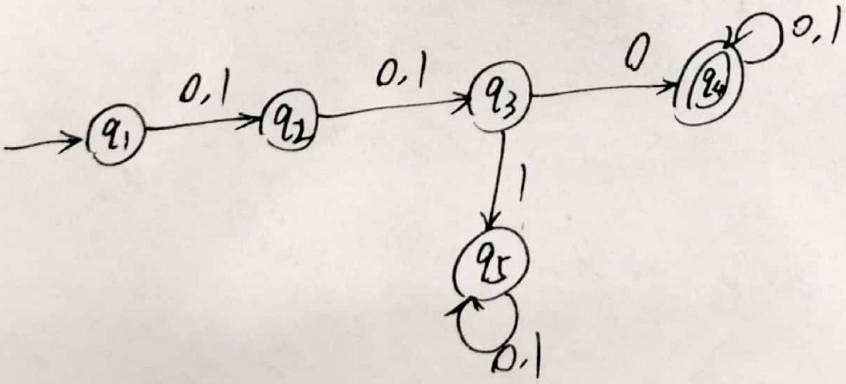
q1
q2
q3
q4
0
1
0,1

(c)



q1
q2
q3
q4
q5
0
1
0,1

(d)



q1
q2
q3
q4
q5
0,1
0
1

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) $\exists x(P(x)\land A(x,m))$

(c) $A(m,m)$

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

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

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

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

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

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

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

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

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

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

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, $\phi=\forall x\exists y\exists z(x<y+1\land z<y+1\land(x<z+1\to z<x+1))$

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.