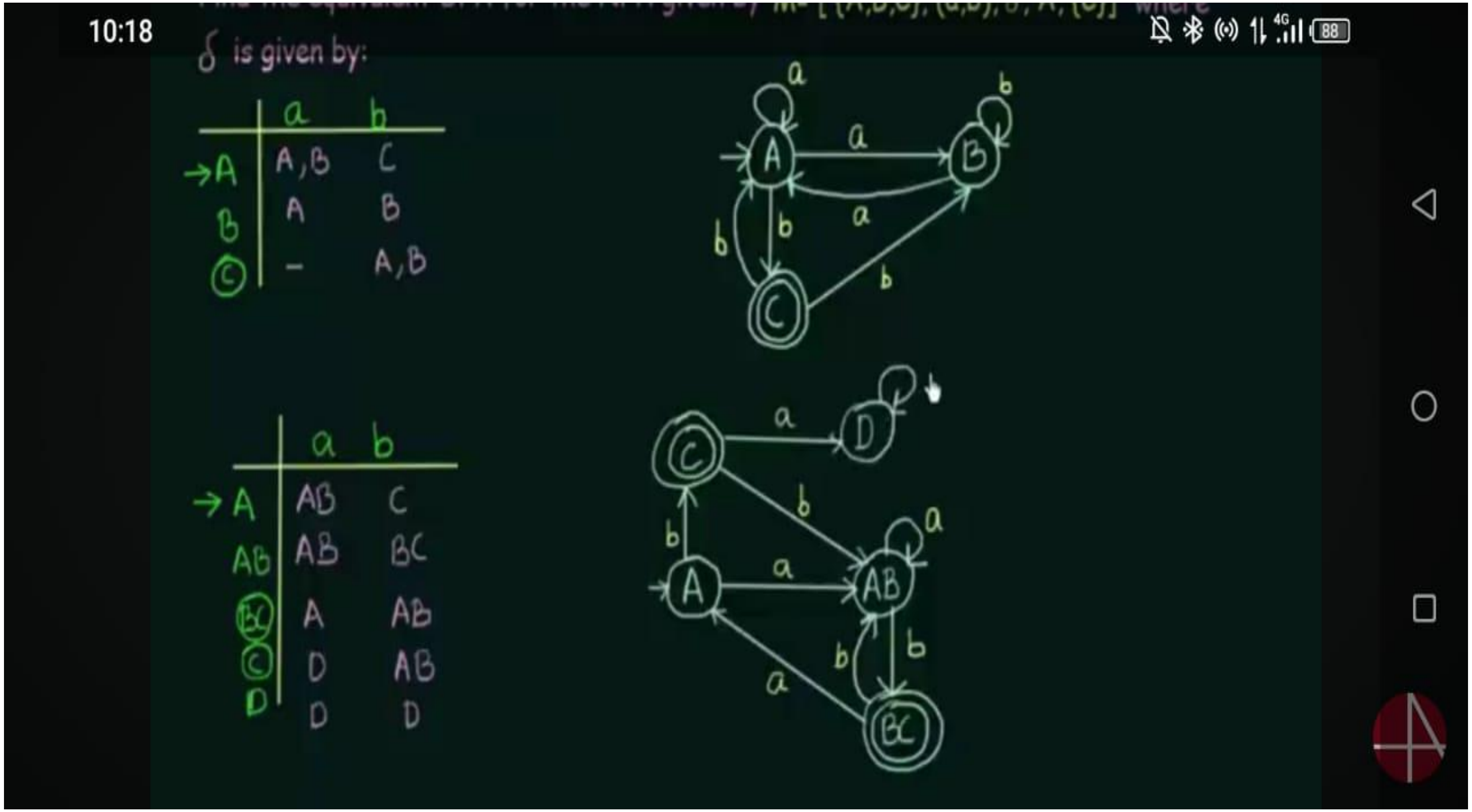
TAFL NOTES

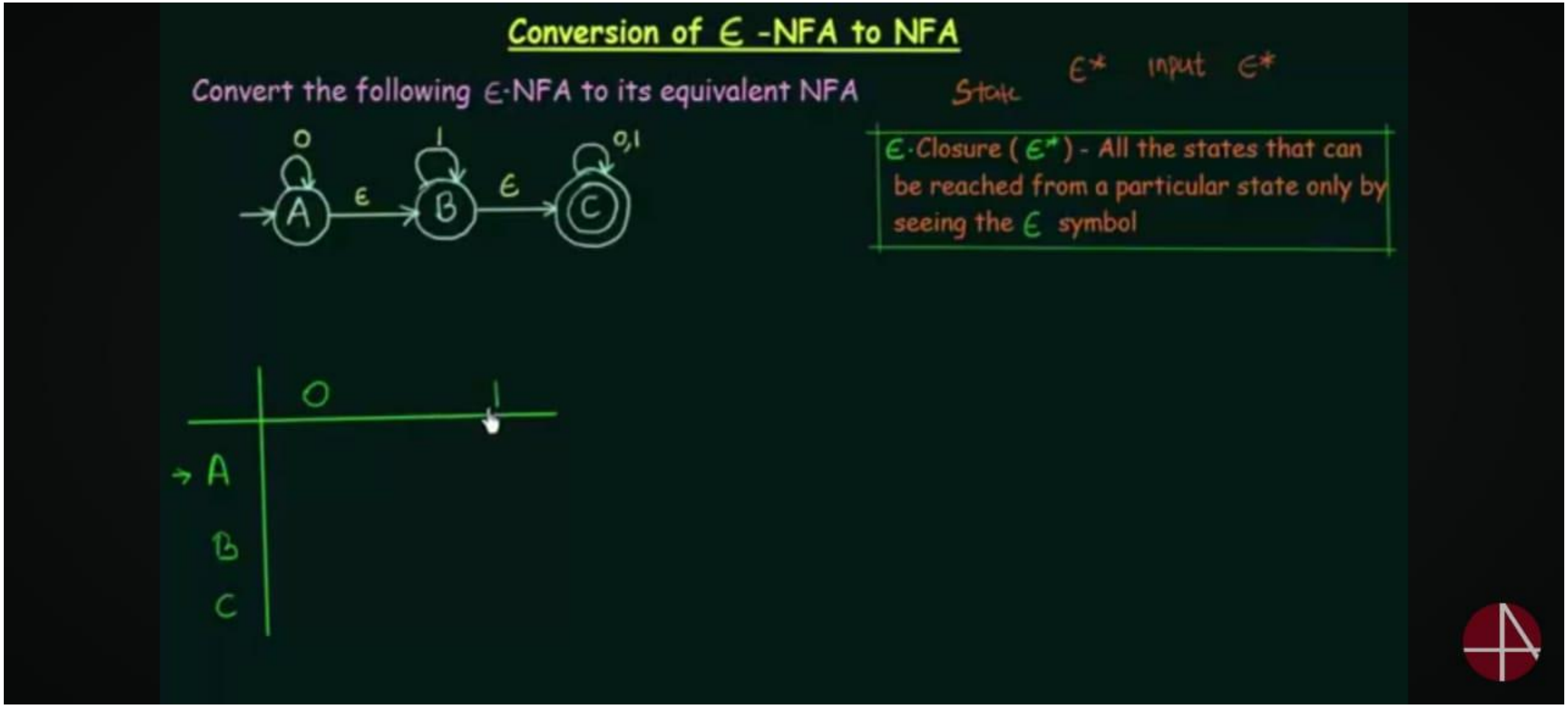
NFA TO DFA



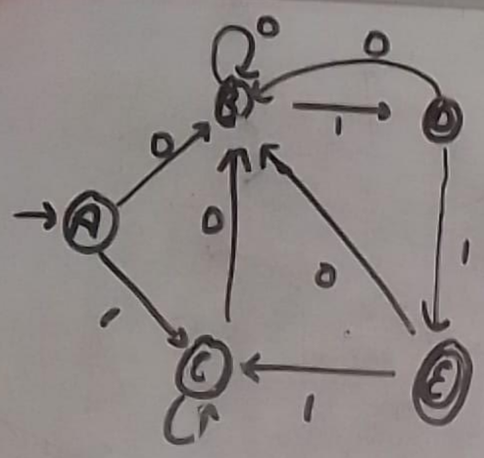
	a	b
→A	A,B	C
B	A	B
ⓒ	–	A,B

	a	b
→A	AB	C
AB	AB	BC
(BC)	A	AB
ⓒ	D	AB
D	D	D

<u>NFA *WITH* EPSILON *TO* NFA *WITHOUT* EPSILON</u>



DFA MINIMIZATION



T.D

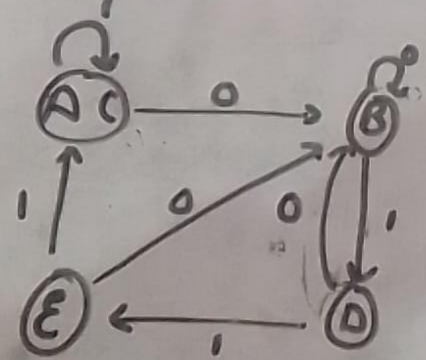
	0	1
→A	B	C
B	B	D
C	B	C
D	B	E
E	B	C

0 Equivalence: Initial state {A, B, C, D} Final state {E}

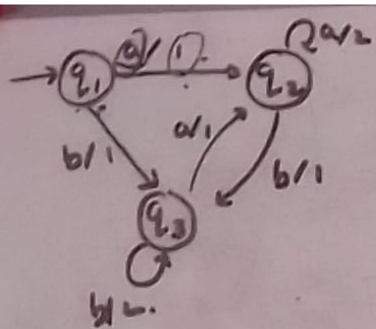
1 Equivalence:- {A, B, C} {D} {E}

2 Equivalence:- {A, C} {B} {D} {E}

3 Equivalence:- {A, C} {B} {D} {E}



MEALY TO MOORE



	a		b	
	state	o/p	state	o/p
q_1	q_2	1	q_3	1
q_2	q_2	2	q_3	1
q_3	q_2	1	q_3	2

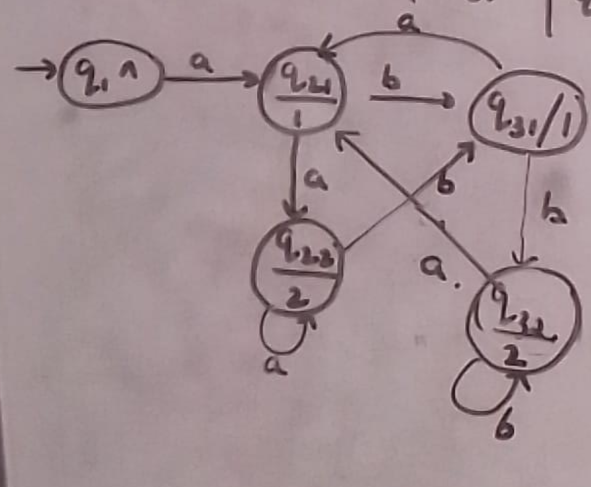
Mealy

$q_2 \to q_{21}$
$q_2 \to q_{22}$

$q_3 \to q_{31}$
$q_3 \to q_{32}$

Moore

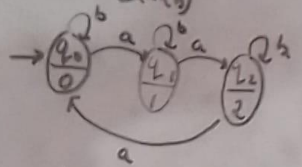
	a	b	
q_1	q_{21}	q_{31}	—
q_{21}	q_{22}	q_{31}	1
q_{22}	q_{22}	q_{31}	2
q_{31}	q_{21}	q_{32}	1
q_{32}	q_{21}	q_{32}	



MOORE TO MEALY

Moore → Mealy

Q) Construct a Moore M/c that counts no. of a's % 3
Convert into equivalent Mealy M/c over Σ(a,b)



aa

Moore M/c. that counts no. of a's % 3

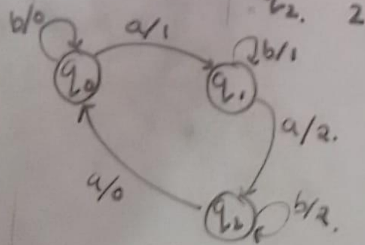
	a	b	o/p
q_0	q_1	q_0	0
q_1	q_2	q_1	1
q_2	q_0	q_2	2

P.S

Moore Machine
↓
Mealy

N.S
i/p

	a		b	
	State	o/p	State	o/p
q_0	q_1	1	q_0	0
q_1	q_2	2	q_1	1
q_2	q_0	0	q_2	2

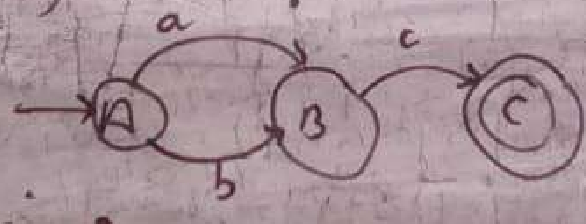


Regular Expression $\longrightarrow$ Finite Automata

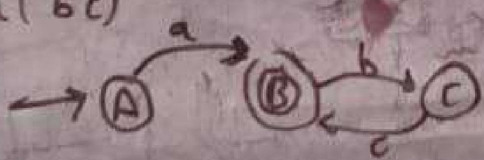
1) ba^*b $\underbrace{b}$ followed by 0 or more no. of $\underbrace{a's}$ and then $\underbrace{b}$

i.e bb, bab, baab ------

2) $(a+b)c \equiv ac+bc$

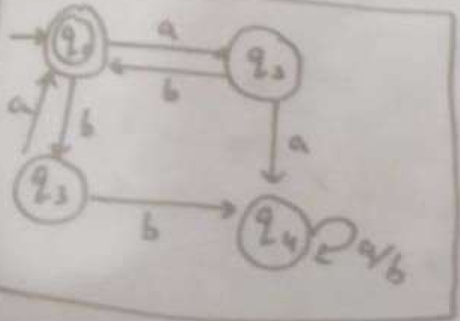


3) $a(bc)^*$



DFA to regular expression

DFA to Reg. Exp.



Step ①

$q_1 = \epsilon + a q_3 + b q_2$

$q_2 = q_1 a$

$q_3 = q_1 b$

Enter text

$q_4 = q_2 a + q_3 b + q_4 (a+b)$

Step ②

$q_1 = \epsilon + a q_1 b + b q_1 a$

$\boxed{q_1 = \epsilon + q_1 (ab+ba)}$

By Arden's theorem.

$q_1 = \epsilon (ab+ba)^*$

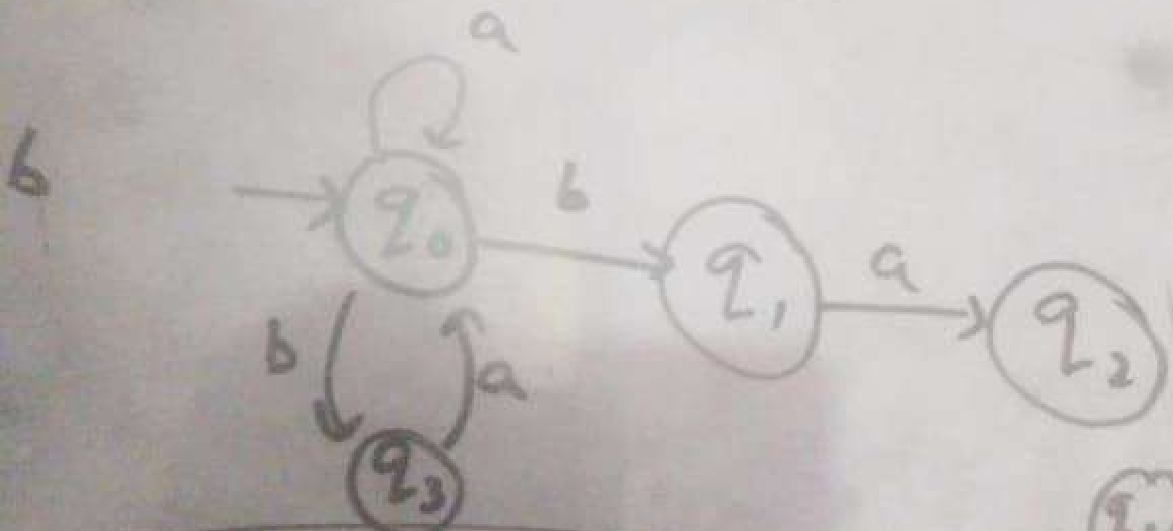
$\boxed{q_1 = (ab+ba)^*}$

$\therefore \; r = q + rp \Rightarrow r = qp^*$

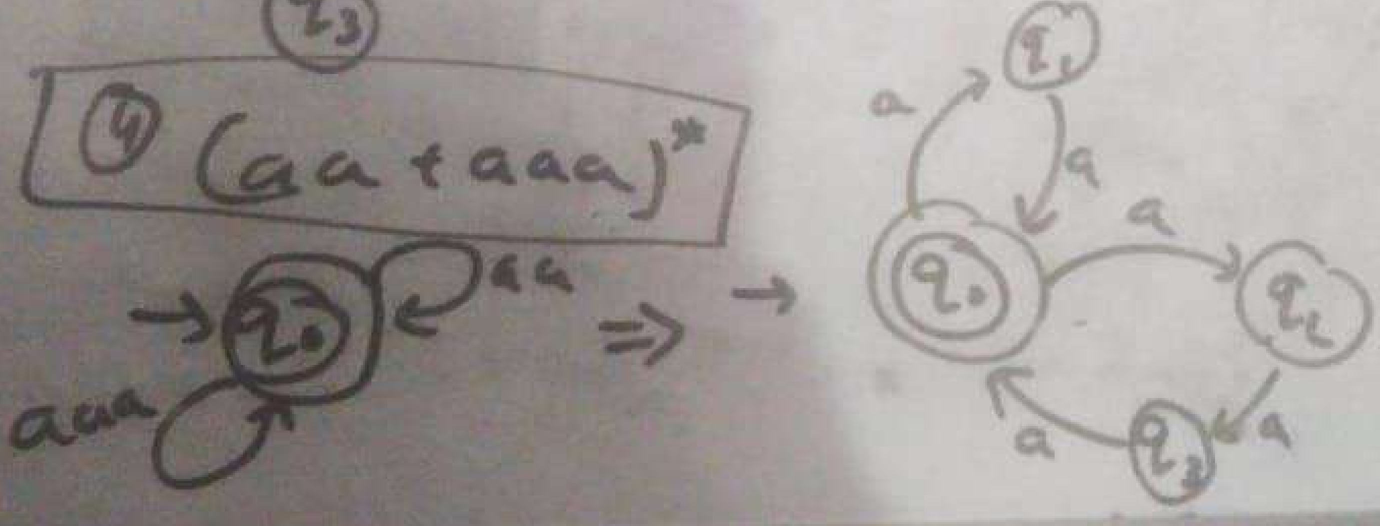
Regex to NFA

⑤ $(a+aaaa)^*$

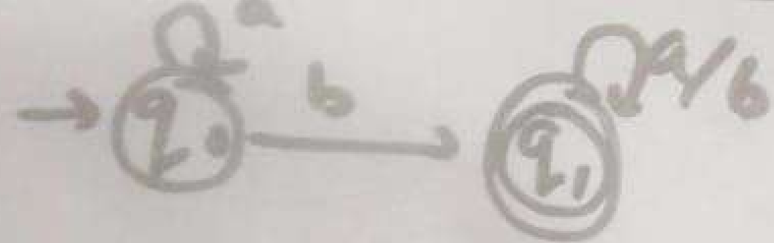
③ $(a+ba)^*\ ba$



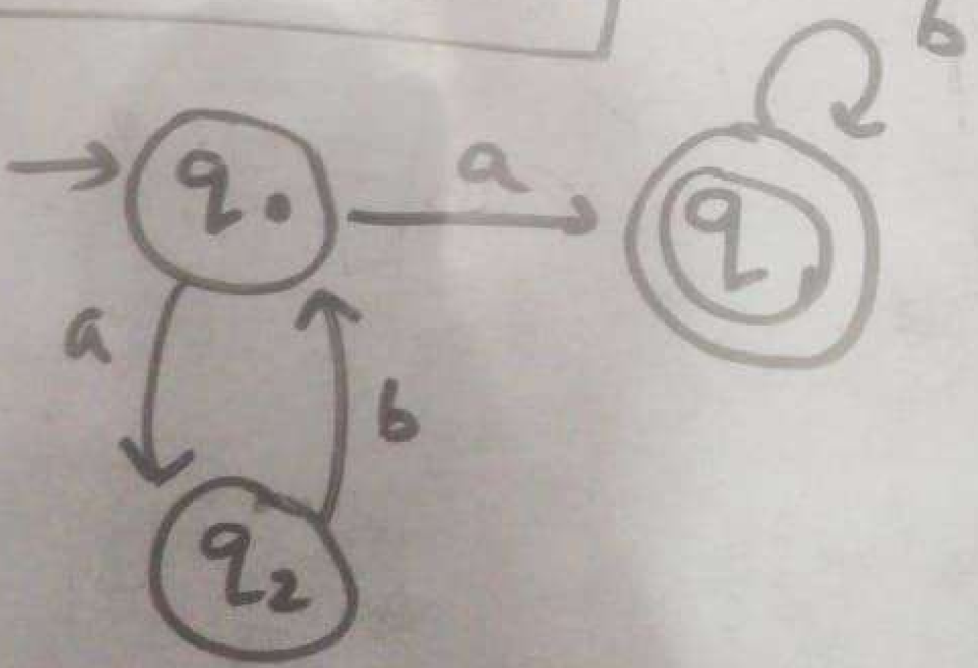
④ $(aa+aaa)^*$



① $a^* b(a+b)^*$



② $(ab)^* ab^*$



Equivalence of Regex

LHS

$(1+00^*1) + (1+00^*1)(0+10^*1)^*(0+10^*1)$

$\Rightarrow (1+00^*1)\left[\epsilon + (0+10^*1)^*(0+10^*1)\right]$

using property
$\epsilon + r^*r \equiv r^*$

$\Rightarrow (1+00^*1)(0+10^*1)^*$

$\Rightarrow 1(\epsilon + 00^*)(0+10^*1)^*$

Again using $\epsilon + 00^* = 0^*$,

$\Rightarrow \underline{1(0)^*(0+10^*1)^*} = RHS$

Hence verified.

Properties

$I_1 : \phi + R \equiv R$

$I_2 : \phi R + R\phi = \phi$

$I_3 : \epsilon R + R\epsilon =$

$I_4 : \epsilon^* = \phi^* =$

$I_5 : R + R = R$

$I_6 : R^* R^* = R^*$

$I_7 : RR^* = R^*R$

$I_8 : (R^*)^* = R^*$

$I_9 : \epsilon + RR^* = R$

$(PQ)^*P = P(QP)^*$

$(P+Q)^* = (P^*Q^*)^*$

$(P+Q)R = PR +$

$R(P+Q) = RP +$

Properties

I_1 : $\phi + R = R$.

I_2 : $\phi R + R\phi = \phi$

I_3 : $\epsilon R + R\epsilon = R$.

I_4 : $\epsilon^* = \phi^* = \epsilon$

I_5 : $R + R = R$

I_6 : $R^* R^* = R^*$

I_7 : $RR^* = R^*R$.

$(R^*)^* = R^*$

$\epsilon + RR^* = R^*$

$(PQ)^*P = P(QP)^*$

$(P+Q)^* = (P^*Q^*)^* (P^* + Q^*)^*$

$(P+Q)R = PR + QR$

$R(P+Q) = RP + RQ$