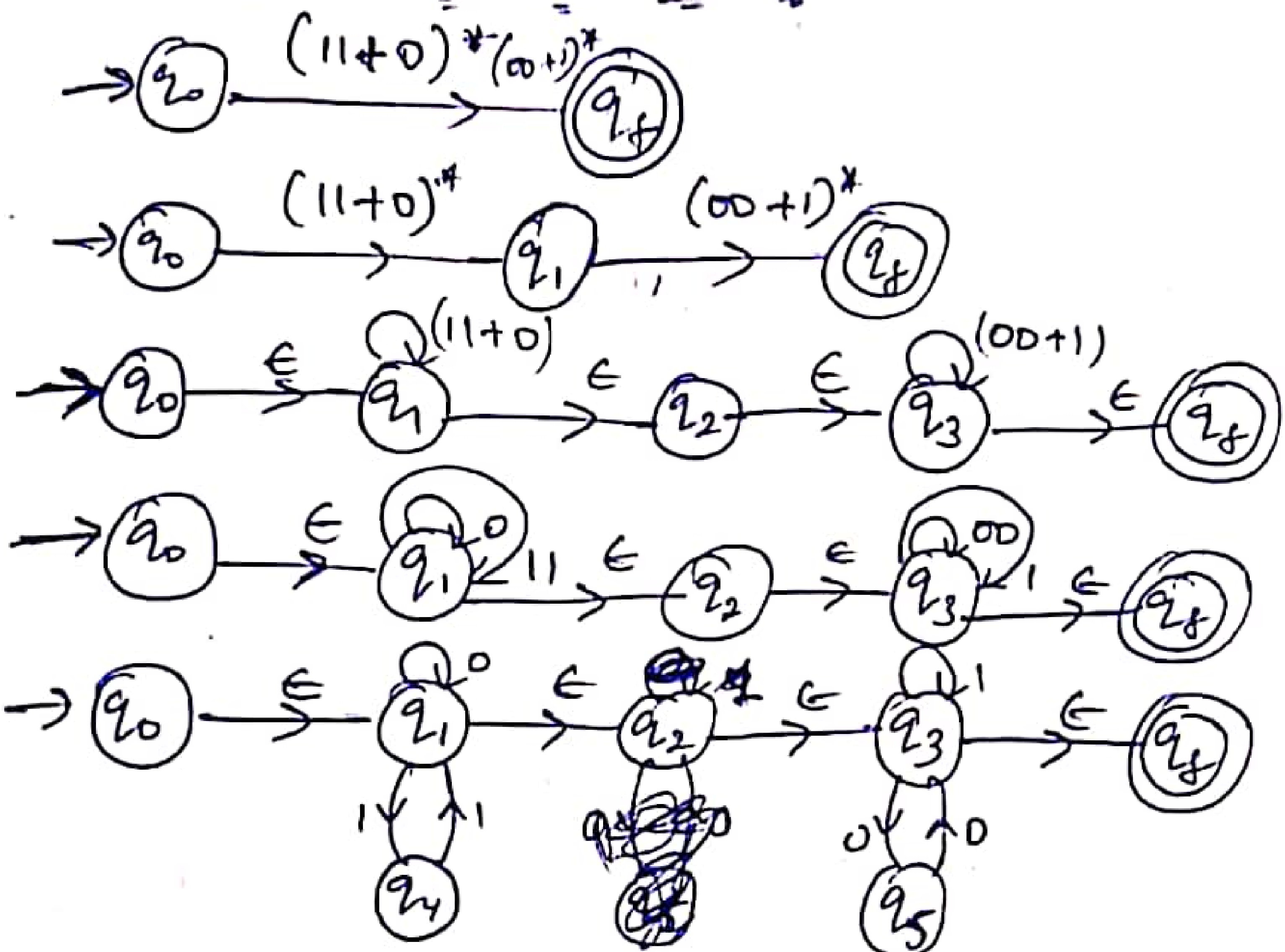
1. Convert RE $(11+0)^* (00+1)^*$ to FA.

Sol: Conversion of RE - NFA - ϵ.



Conversion of NFA - ϵ to NFA.

δ'	0	1	ϵ
q_0	ϕ	ϕ	q_1
q_1	q_1	q_4	q_2
q_2	ϕ	ϕ	q_3
q_3	q_5	q_3	q_f
q_4	ϕ	q_1	ϕ
q_5	q_3	ϕ	ϕ
q_f	ϕ	ϕ	ϕ

ϵ-closures $(q_0) = q_0, q_1, q_2, q_3, q_f$

ϵ-closure $(q_1) = q_1, q_2, q_3, q_f$

ϵ-closure $(q_2) = q_2, q_3, q_f$

ϵ-closure $(q_3) = q_3, q_f$

ϵ-closure $(q_4) = q_4$

ϵ-closure $(q_5) = q_5$

ϵ-closure $(q_f) = q_f$

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$\hat{\delta}'(q_0, 0) = \epsilon\text{-closures}(\delta(\hat{\delta}(q_0, \epsilon)), 0) = \epsilon\text{-closures}(\delta(q_0, q_1, q_2, q_4), 0)$

$= \epsilon\text{-closures}(\delta(q_0, 0) \cup \delta(q_1, 0) \cup \delta(q_2, 0) \cup \delta(q_3, 0)\, \delta(q_4, 0))$

$= \epsilon\text{-closures}(\phi \cup q_1 \cup \phi \cup q_5, \phi)$

$= \epsilon\text{-closures}(q_1) \cup \epsilon\text{-closures}(q_5) = (q_1, q_2, q_3, q_f) \cup (q_5)$

$= q_1, q_2, q_3, q_5, q_f$

$\delta'(q_0, 1) = \epsilon\text{-closures}(\delta(q_0, 1) \cup \delta(q_1, 1) \cup \delta(q_2, 1) \cup \delta(q_3, 1) \cup \delta(q_f, 1))$

$= \epsilon\text{-closures}(\phi \cup q_4 \cup \phi \cup q_3 \cup \phi) = \epsilon\text{-closures}(q_4) \cup \epsilon\text{-closures}(q_3)$

$= (q_4) \cup (q_3, q_f) = q_3, q_4, q_f.$

$\delta'(q_1, 0) = \epsilon\text{-closures}(q_1 \cup \phi \cup q_5 \cup \phi)$

$= \epsilon\text{-closures}(q_1) \cup \epsilon\text{-closures}(q_5) = (q_1, q_2, q_3, q_f) \cup q_5$

$= q_1, q_2, q_3, q_5, q_f.$

$\delta'(q_1, 1) = \epsilon\text{-closures}(q_4 \cup \phi \cup q_3 \cup \phi) = \epsilon\text{-closures}(q_4) \cup \epsilon\text{-closures}(q_3)$

$= (q_4) \cup (q_3, q_f) = q_3, q_4, q_f.$

$\delta'(q_2, 0) = \epsilon\text{-closures}(\phi \cup q_5 \cup \phi) = \epsilon\text{-closures}(q_5) = q_5$

$\delta'(q_2, 1) = \epsilon\text{-closures}(\phi \cup q_3 \cup \phi) = \epsilon\text{-closures}(q_3) = q_3, q_f$

$\delta'(q_3, 0) = \epsilon\text{-closures}(q_5 \cup \phi) = \epsilon\text{-closures}(q_5) = q_5$

$\delta'(q_3, 1) = \epsilon\text{-closures}(q_3 \cup \phi) = \epsilon\text{-closures}(q_3) = q_3, q_f$

$\delta(q_4, 0) = \epsilon\text{-closures}(\phi) = \phi$

$\delta(q_4, 1) = \epsilon\text{-closures}(q_1) = q_1, q_2, q_3, q_f$

$\delta(q_5, 0) = \epsilon\text{-closures}(q_3) = q_3, q_f$

$\delta(q_5, 1) = \epsilon\text{-closures}(\phi) = \phi$

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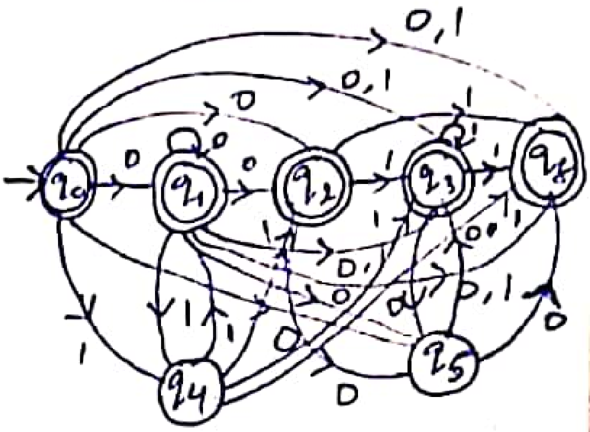
$\delta'(q_f, 0) = \epsilon\text{-closure}(\emptyset) = \emptyset$

$\delta'(q_f, 1) = \epsilon\text{-closures}(\emptyset) = \emptyset$

NFA T.T

δ'	0	1
$* q_0$	$\{q_1, q_2, q_3, q_5, q_f\}$	$\{q_3, q_4, q_f\}$
$* q_1$	$\{q_1, q_2, q_3, q_5, q_f\}$	$\{q_3, q_4, q_f\}$
$* q_2$	$\{q_5\}$	$\{q_3, q_f\}$
$* q_3$	$\{q_5\}$	$\{q_3, q_f\}$
q_4	$\{\emptyset\}$	$\{q_1, q_2, q_3, q_f\}$
q_5	$\{q_3, q_f\}$	$\{\emptyset\}$
$* q_f$	$\{\emptyset\}$	$\{\emptyset\}$

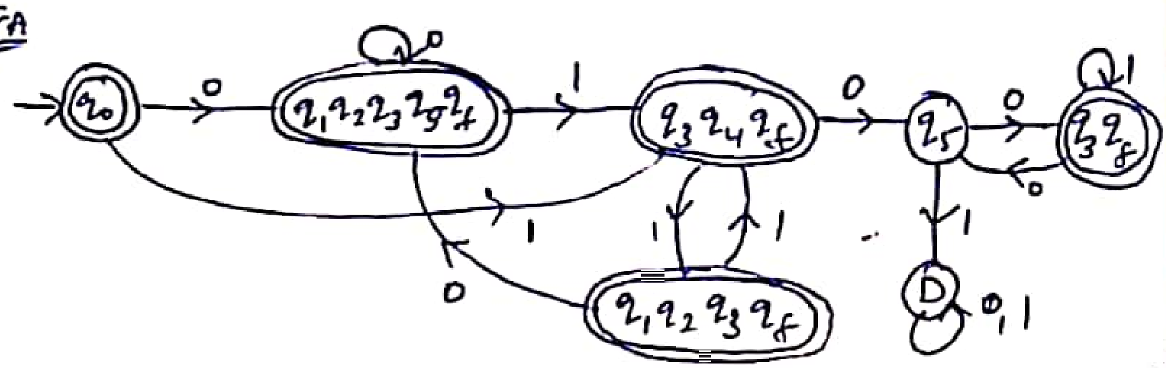
NFA.



DFA T.T.

δ''	0	1
$* q_0$	$\{q_1 q_2 q_3 q_5 q_f\}$	$\{q_3 q_4 q_f\}$
$* q_1 q_2 q_3 q_5 q_f$	$\{q_1 q_2 q_3 q_5 q_f\}$	$\{q_3 q_4 q_f\}$
$* q_3 q_4 q_f$	$\{q_5\}$	$\{q_1 q_2 q_3, q_f\}$
q_5	$\{q_3 q_f\}$	$\{D\}$
$* q_1 q_2 q_3 q_f$	$\{q_1 q_2 q_3 q_5 q_f\}$	$\{q_3 q_4 q_f\}$
$* q_3 q_f$	$\{q_5\}$	$\{q_3 q_f\}$
D	D	D

DFA



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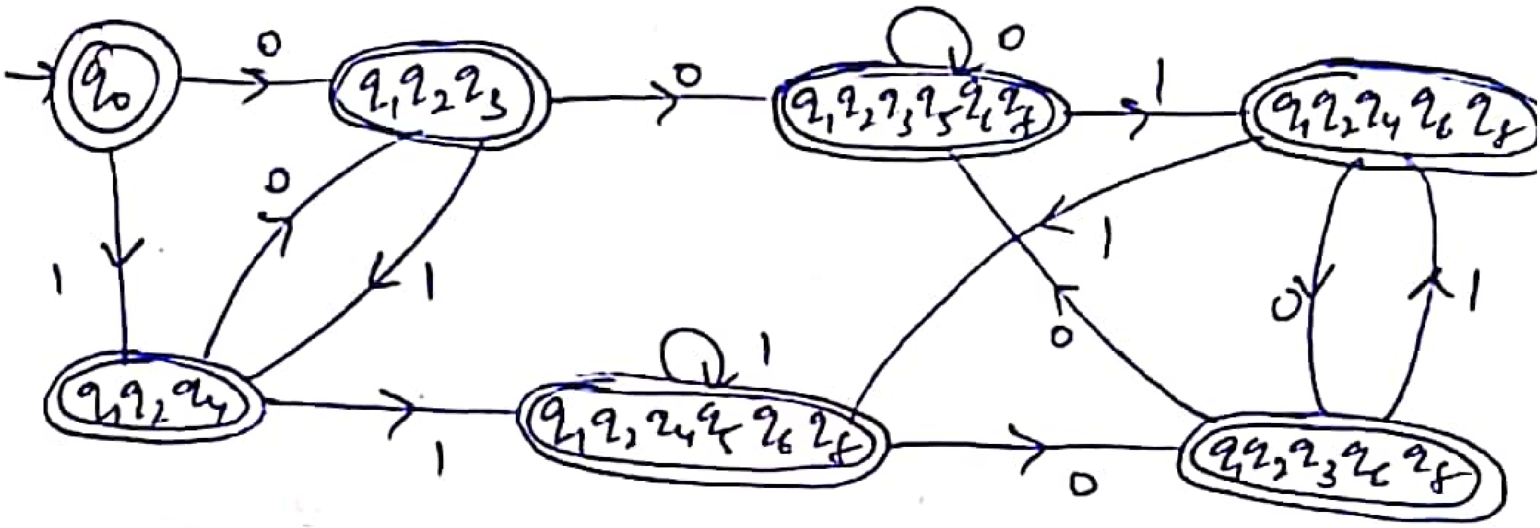
DFA



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