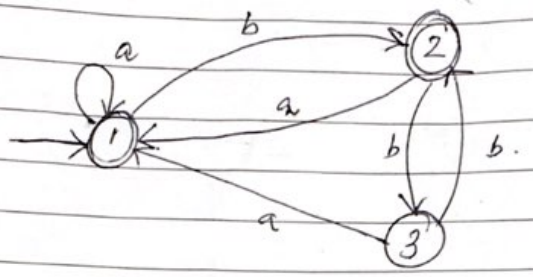
ASSIGNMENT # 02

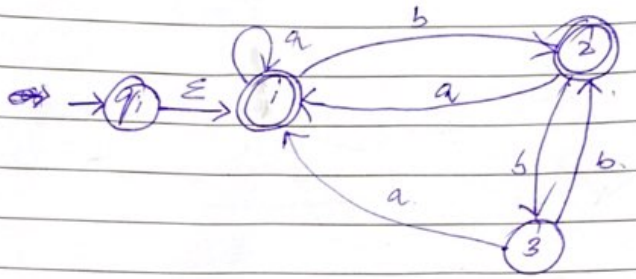
Date: _____

M. BASIL ALI KHAN.
20K-0477.

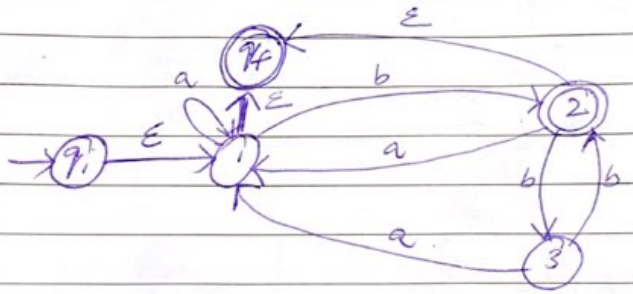
Question #01.



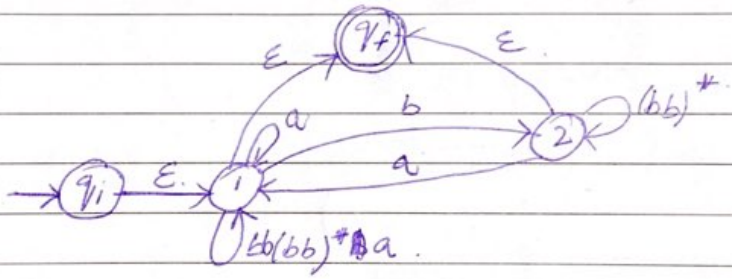
⇒



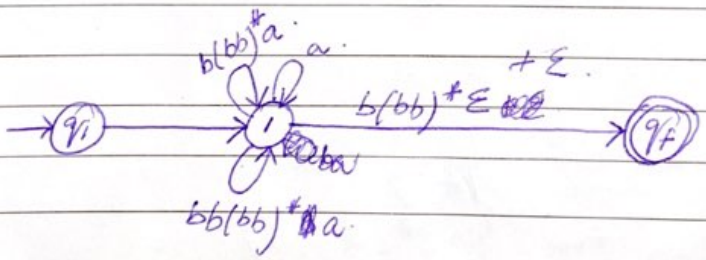
⇒



⇒



⇒



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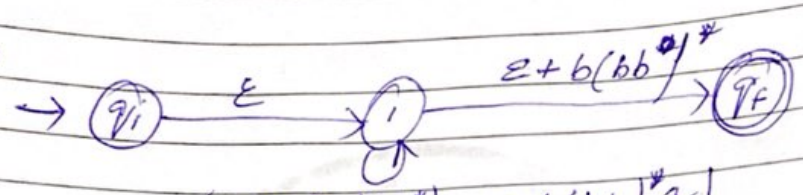
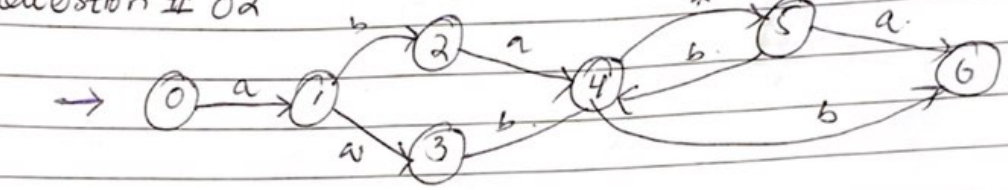
⇒

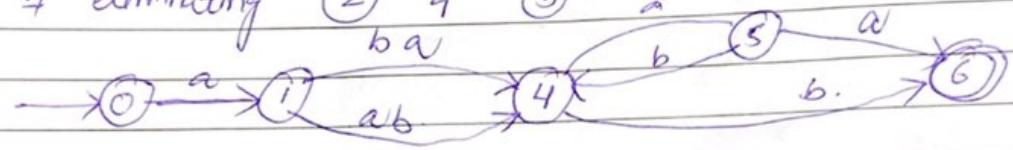


RE ⇒ (a + bb(bb)*a + b(bb)*a)* (ε + b(bb)*).

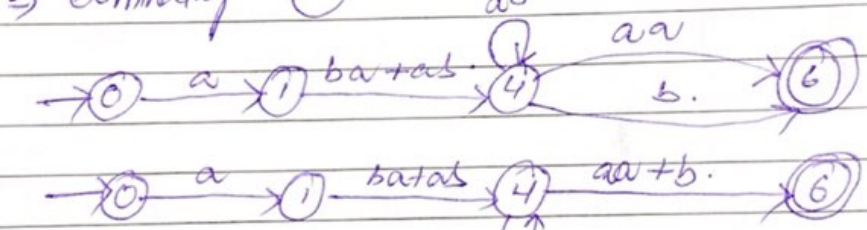
Question # 02



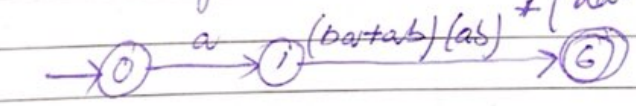
⇒ eliminating (2) & (3).



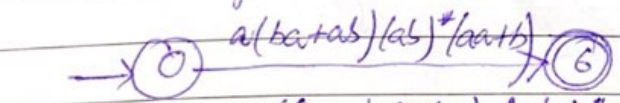
⇒ eliminating (5)



⇒ eliminating (4).



⇒ eliminating (1).



RE ⇒ a(ba+ab)(ab)*(aa+b)

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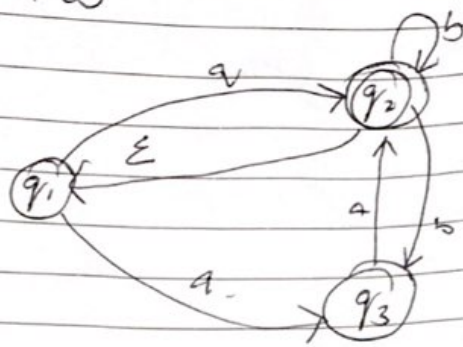
Question #03



⇒ TT for E-closure.

States.	Eclosure.
q_1	$\{q_1\}$
q_2	$\{q_2, q_1\}$
q_3	$\{q_3\}$.

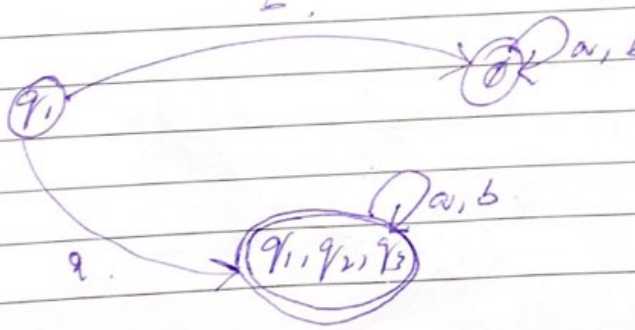
⇒ TT for NFA.

States	a	b
q_1	$\{q_2, q_3\}$	$\emptyset$
q_2	$\emptyset$	$\{q_2, q_3\}$.
q_3	$\{q_3\}$.	$\emptyset$

⇒ TT for DFA.

States	a	b.
$\{q_1\}$	$\{q_1, q_2, q_3\}$	$\emptyset$
$\{q_1, q_2, q_3\}$	$\{q_1, q_2, q_3\}$	$\{q_1, q_2, q_3\}$.
$\emptyset$	$\emptyset$	$\emptyset$

⇒ DFA



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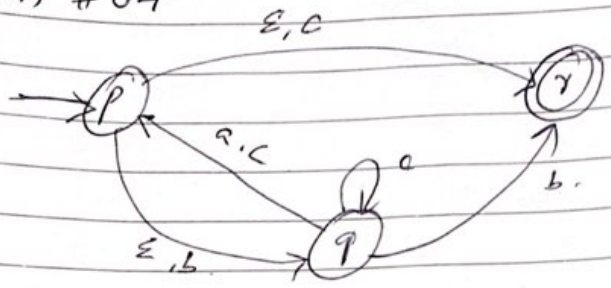
Question #04



⇒ TT for ε-closure.

States	ε-closure
p	{p, r, q}
q	{q}
r	{r}

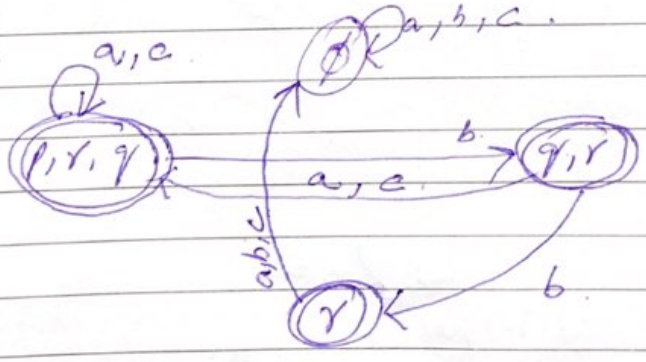
⇒ TT for NFA

States	a	b	c
p	∅	q	r
q	p	r	{p, q}
r	∅	∅	∅

⇒ TT for DFA

States	a	b	c
{p, r, q}	{p, r, q}	{q, r}	{p, r, q}
{q, r}	{p, r, q}	{r}	{p, r, q}
{r}	∅	∅	∅
∅	∅	∅	∅

⇒ DFA



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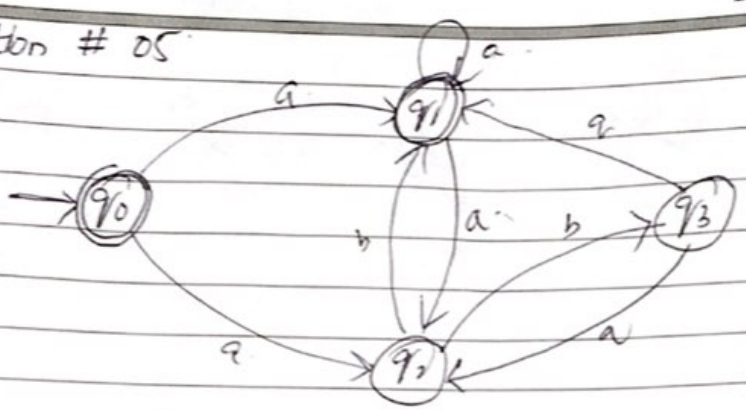
Question # 05



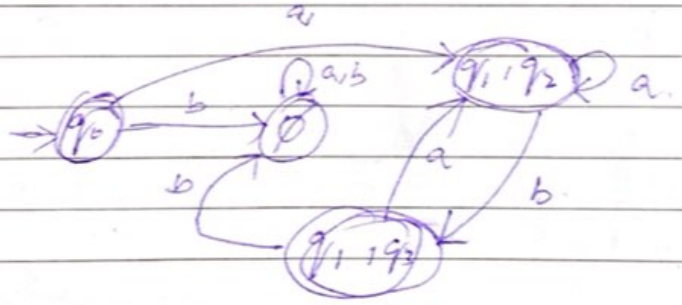
⇒ TT for NFA.

States	a	b
q_0	$[q_1, q_2]$	ϕ
q_1	$[q_1, q_2]$	ϕ
q_2	ϕ	q_1, q_3
q_3	q_2, q_1	ϕ

⇒ TT for DFA.

States	a	b
$\{q_0\}$	$[q_1, q_2]$	ϕ
$[q_1, q_2]$	$[q_1, q_2]$	$[q_1, q_3]$
$[q_1, q_3]$	$[q_1, q_2]$	ϕ
ϕ	ϕ	ϕ

⇒ DFA



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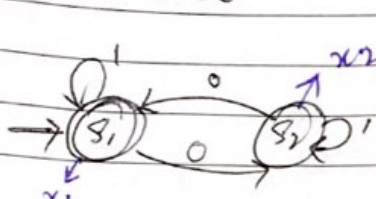
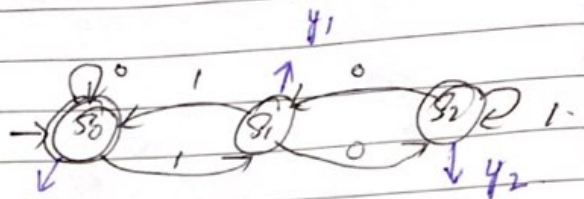
Question #06.



FA1

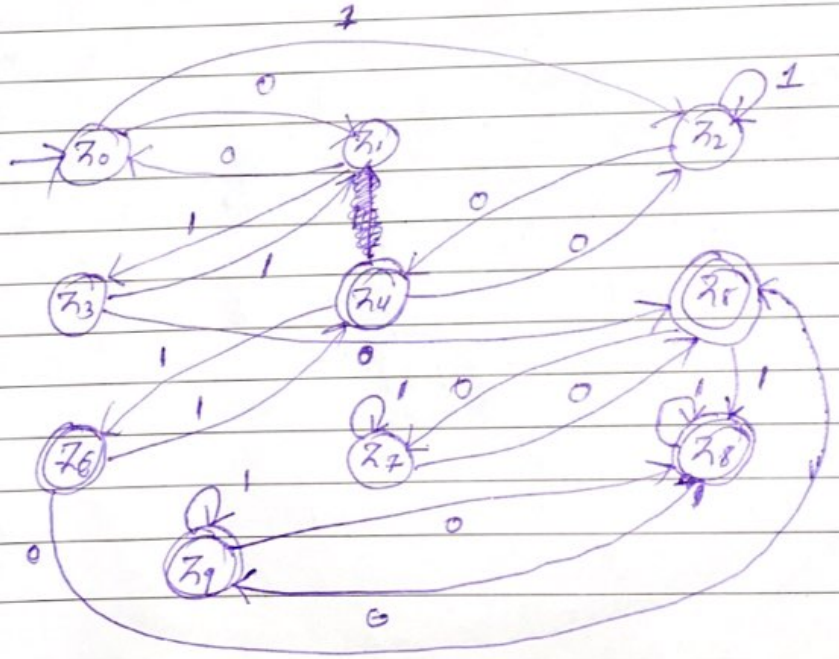


FA2.

1) Concatenation.

States.	0	1
~~Z1~~	~~Z2~~	~~Z3~~
$x_1y_0 \equiv z_0$	$x_2y_0 \equiv z_1$	$x_1y_0y_1 \equiv z_2$
$x_2y_0 \equiv z_1$	$x_1y_0 \equiv z_0$	$x_2y_1 \equiv z_3$
$x_1y_0y_1 \equiv z_2$	$x_2y_0y_2 \equiv z_4$	$x_1y_0y_1 \equiv z_2$
$x_2y_1 \equiv z_3$	$x_1y_0y_2 \equiv z_5$	$x_2y_0 \equiv z_1$
$x_2y_0y_2 \equiv z_4$	$x_1y_0y_1 \equiv z_2$	$x_2y_1y_2 \equiv z_6$
$x_1y_0y_2 \equiv z_5$	$x_2y_0y_1 \equiv z_7$	$x_1y_0y_1y_2 \equiv z_8$
$x_2y_1y_2 \equiv z_6$	$x_1y_0y_1y_2 \equiv z_8$	$x_2y_0y_2 \equiv z_4$
$x_2y_0y_1 \equiv z_7$	$x_1y_0y_2 \equiv z_5$	$x_2y_1y_0 \equiv z_7$
$x_1y_0y_1y_2 \equiv z_8$	$x_2y_0y_2y_1 \equiv z_9$	$x_1y_0y_1y_2 \equiv z_8$
$x_2y_0y_2y_1 \equiv z_9$	$x_1y_0y_1y_2 \equiv z_8$	$x_2y_1y_2y_0 \equiv z_9$

$\Rightarrow$ DFA



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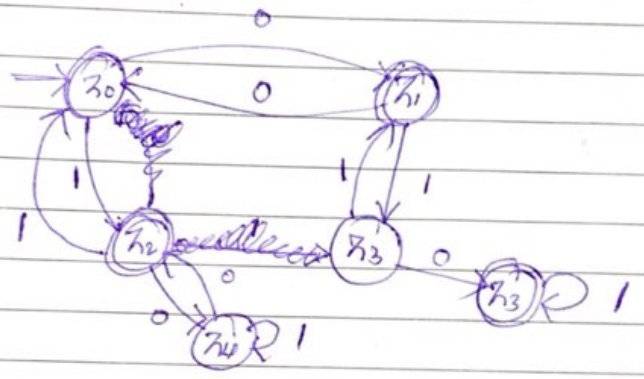
ii) Union :

States	0	1
$\rightarrow + x_1y_0 \equiv z_0$	$x_2y_0 \equiv z_1$	$x_1y_1 \equiv z_2$
$+ x_2y_0 \equiv z_1$	$x_1y_0 \equiv z_0$	$x_2y_1 \equiv z_3$
$+ x_1y_1 \equiv z_2$	$x_2y_2 \equiv z_4$	$x_1y_0 \equiv z_0$
$x_2y_1 \equiv z_3$	$x_1y_2 \equiv z_5$	$x_2y_0 \equiv z_1$
$x_2y_2 \equiv z_4$	$x_1y_1 \equiv z_2$	$x_2y_2 \equiv z_4$
$+ x_1y_2 \equiv z_5$	$x_2y_1 \equiv z_3$	$x_1y_2 \equiv z_5$

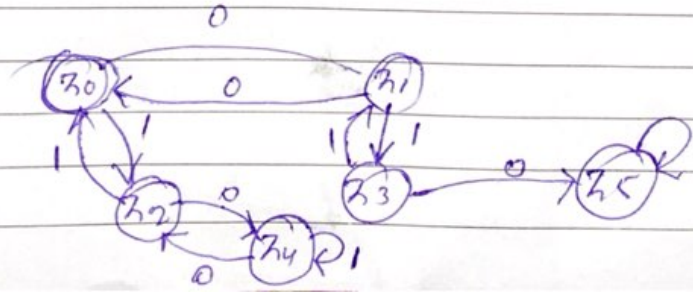
$\Rightarrow$ DFA



iii) Intersection

states	0	1
$\rightarrow + x_1y_0 \equiv z_0$	$x_2y_0 \equiv z_1$	$x_1y_1 \equiv z_2$
$x_2y_0 \equiv z_1$	$x_1y_0 \equiv z_0$	$x_2y_1 \equiv z_3$
$x_1y_1 \equiv z_2$	$x_2y_2 \equiv z_4$	$x_1y_0 \equiv z_0$
$x_2y_1 \equiv z_3$	$x_1y_2 \equiv z_5$	$x_2y_0 \equiv z_1$
$x_2y_2 \equiv z_4$	$x_1y_1 \equiv z_2$	$x_2y_2 \equiv z_4$
$x_1y_2 \equiv z_5$	$x_2y_1 \equiv z_3$	$x_1y_2 \equiv z_5$

$\Rightarrow$ DFA



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iv) ~~e~~closure

States	0	1
S_1	S_2	S_1
S_2	S_1	S_2

⇒ DFA