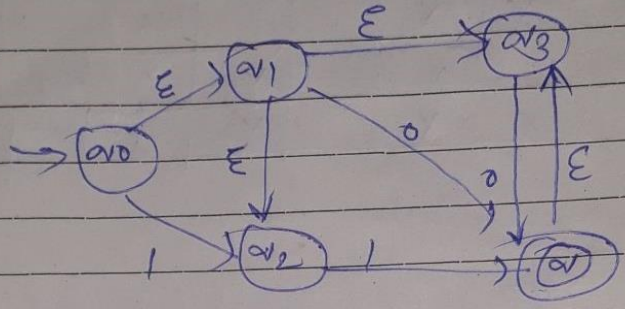
ASSIGNMENT-2

Section - A

1) Convert the following NFAs with ε moves to equivalent DFAs

(a)



Solution

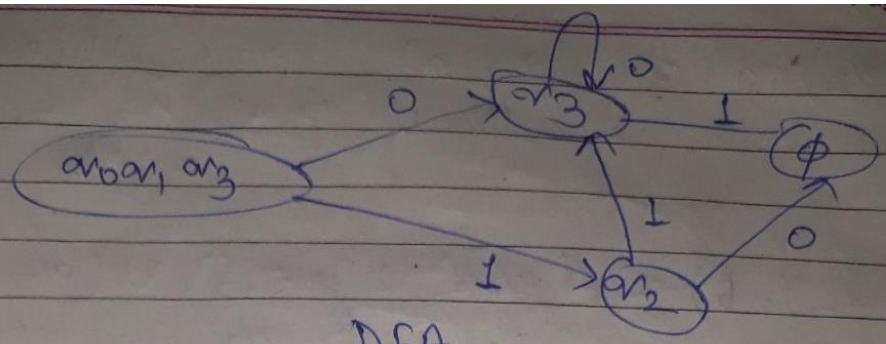
δ	ε	0	1
→ q_0	$q_0q_1q_3$	ϕ	q_2
q_1	q_2q_3	q_4	ϕ
q_2	ϕ	ϕ	q_4
q_3	ϕ	q_4	ϕ
* q_4	q_3	ϕ	ϕ

$\varepsilon C = q_0 = q_0q_1q_3$
$q_1 = q_2q_3$
$q_2 = q_2$
$q_3 = q_3$
$q_4 = q_3$

$(q_0q_1q_3, 0) = (q_0, 0) \cup (q_1, 0) \cup (q_3, 0)$
$= \phi \cup q_4 \cup q_4 = \varepsilon C(q_4) = q_3$

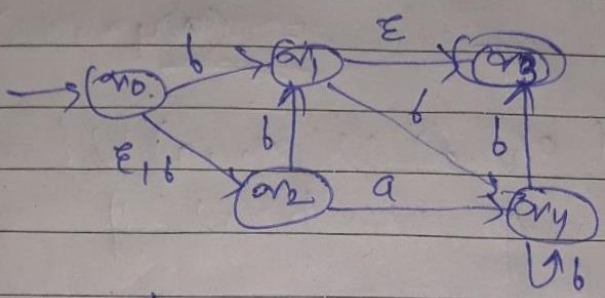
$(q_0q_1q_3, 1) = (q_0, 1) \cup (q_1, 1) \cup (q_3, 1)$
$= q_2 \cup \phi \cup \phi = \varepsilon C(q_2) = q_2$

$(q_3, 0) = \varepsilon C(q_4) = q_3$
$(q_3, 1) = \phi = \phi$
$(q_2, 0) = \phi = \phi$
$(q_2, 1) = \varepsilon C(q_4) = q_3$



DFA

(B)



δ	ε	a	b
q_0	q_2	ϕ	$(q_1 q_2)$
q_1	q_3	ϕ	q_4
q_2	ϕ	q_4	q_1
q_3	ϕ	ϕ	ϕ
q_4	ϕ	ϕ	q_4

$\varepsilon C = q_0 = q_0 q_2$

$q_1 = q_1 q_3$

$q_2 = q_2$

$q_3 = q_3$

$q_4 = q_4$

$(q_2, a) = \phi \quad \varepsilon C(q_4) = q_4$

$(q_2, b) = \varepsilon C(q_1) = q_1 q_3$

$((q_0 q_2), a) = (q_0, a) \cup (q_2, a)$

$= \phi \cup q_4 = \varepsilon C(q_4) = q_4$

$((q_0 q_2), b) = (q_0, b) \cup (q_2, b)$

$= (q_1 q_2) \cup (q_1)$

$= \varepsilon C(q_1 q_2) = q_1 q_3 q_2$

$(q_4, a) = \phi$

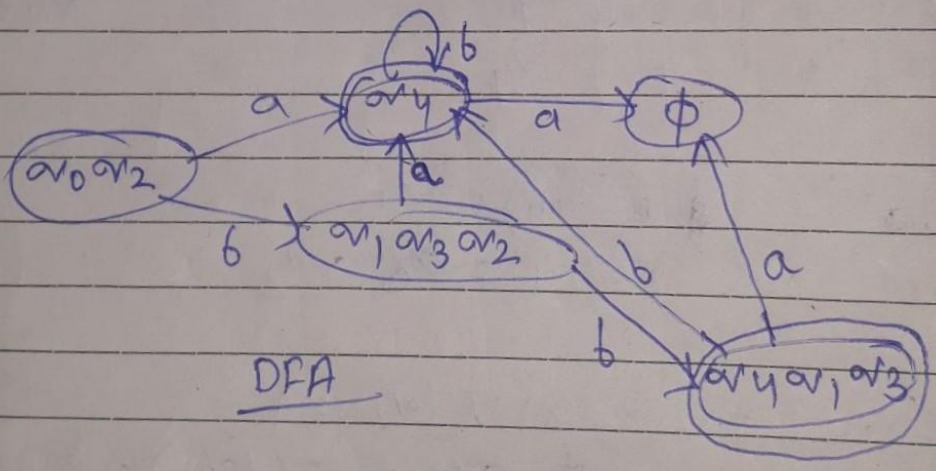
$(q_4, b) = \varepsilon C(q_4) = q_4$

$(q_1 q_3 q_2), a) = (q_1, a) \cup (q_3, a) \cup (q_2, a)$
$= \phi \cup \phi \cup q_4 = E(q_4)$
$= q_4$

$(q_1 q_3 q_2), b) = (q_1, b) \cup (q_3, b) \cup (q_2, b)$
$= q_4 \cup \phi \cup q_1 = E(q_4 q_1)$
$= (q_4 q_1 q_3)$

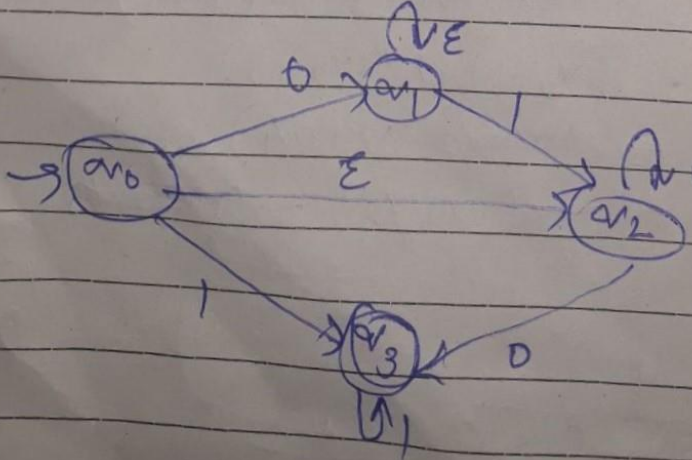
$(q_4 q_1 q_3), a) = (q_4, a) \cup (q_1, a) \cup (q_3, a)$
$= \phi \cup \phi \cup \phi = \phi$

$(q_4 q_1 q_3), b) = (q_4, b) \cup (q_1, b) \cup (q_3, b)$
$= q_4 \cup q_4 \cup \phi$
$= E(q_4) = q_4$



DFA

c)



δ	ε	0	1
→ α_0	α_2	α_1	α_3
α_1	α_1	ϕ	α_2
α_2	ϕ	$\alpha_2\alpha_3$	ϕ
* α_3	ϕ	ϕ	α_3

$EC = \alpha_0 = \alpha_0\alpha_2$

$\alpha_1 = \alpha_1$

$\alpha_2 = \alpha_2$

$\alpha_3 = \alpha_3$

$(\alpha_0\alpha_2), 0) = [\alpha_0, 0) \cup (\alpha_2, 0)$

$= \alpha_1 \cup \alpha_2\alpha_3$

$= EC(\alpha_1\alpha_2\alpha_3) = (\alpha_1\alpha_2\alpha_3)$

$(\alpha_0\alpha_2), 1) = (\alpha_0, 1) \cup (\alpha_2, 1))$

$= \alpha_3 \cup \phi = EC(\alpha_3) = \alpha_3$

$(\alpha_1\alpha_2\alpha_3), 0) = (\alpha_1, 0) \cup (\alpha_2, 0) \cup (\alpha_3, 0)$

$= \phi \cup \alpha_2\alpha_3 \cup \phi$

$= EC(\alpha_2\alpha_3) = \alpha_2\alpha_3$

$(\alpha_1\alpha_2\alpha_3), 1) = (\alpha_1, 1) \cup (\alpha_2, 1) \cup (\alpha_3, 1)$

$= \alpha_2 \cup \phi \cup \alpha_3$

$= EC(\alpha_2\alpha_3) = \alpha_2\alpha_3$

$(\alpha_3, 0) = \phi$

$(\alpha_3, 1) = \alpha_3 = \alpha_3$

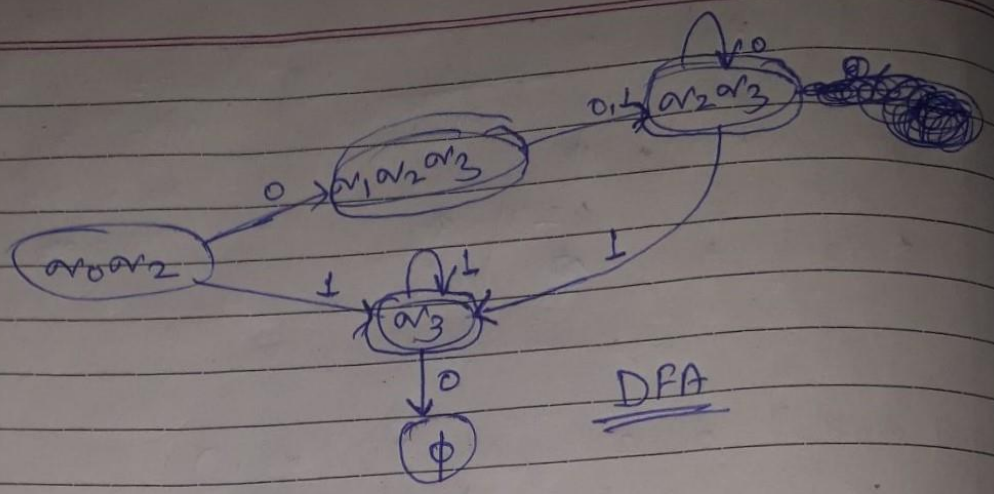
$(\alpha_2\alpha_3), 0) = (\alpha_2, 0) \cup (\alpha_3, 0)$

$= (\alpha_2\alpha_3) \cup \phi$

$= EC(\alpha_2\alpha_3) = \alpha_2\alpha_3$

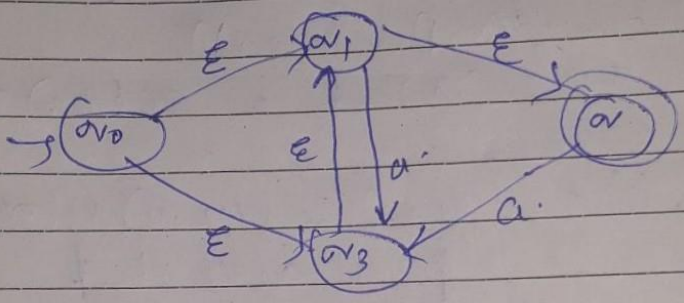
$(\alpha_2\alpha_3), 1) = (\alpha_2, 1) \cup (\alpha_3, 1)$

$= \phi \cup \alpha_3 = EC(\alpha_3) = \alpha_3$



2)

d)



Solve

		a	b
→ q_0	$q_0 q_1 q_2 q_3$	ϕ	ϕ
q_1	q_2	ϕ q_3	ϕ
★ q_2	ϕ	q_3	ϕ
q_3	$q_1 q_2$	ϕ	ϕ

$\varepsilon C = q_0 = q_0 q_1 q_2 q_3$

$q_1 = q_1 q_2$

$q_2 = q_2$

$q_3 = q_1 q_2$

$(q_0 q_1 q_2 q_3), a) = (q_0, a) \cup (q_1, a) \cup (q_2, a) \cup (q_3, a)$

$= \phi \cup q_3 \cup q_3 \cup \phi$

$= \varepsilon C(q_3) = q_1 q_2$

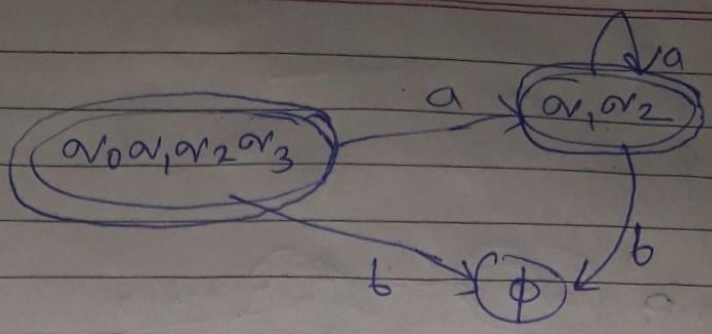
$(q_0 q_1 q_2 q_3), b) = \phi$

$(q_1 q_2), a) = (q_1, a) \cup (q_2, a)$

$= q_3 \cup q_3 = (q_3)$

$\varepsilon C(q_3) = q_1 q_2$

$(q_1 q_2), b) = \phi$



2) Convert the following ε-NFA to equivalent DFA.

	ε	A	b	c.
→p	q,r	ϕ	q	r
q	ϕ	p	r	p,q
*r	ϕ	ϕ	ϕ	ϕ

$EC(p) = p = pqr$
$q = q$
$r = r$

$(pqr), a) = (p,a) \cup (q,a) \cup (r,a)$
$= \phi \cup p \cup \phi$
$= EC(p) = (q,r)$

$(pqr), b) = (p,b) \cup (q,b) \cup (r,b)$
$= q \cup r \cup \phi$
$= EC(qr) = (qr)$

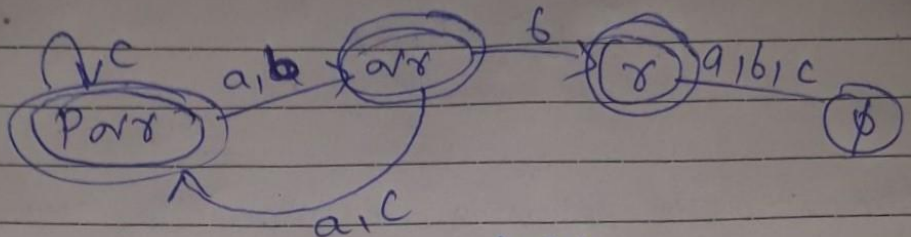
$(pqr), c) = (p,c) \cup (q,c) \cup (r,c)$
$= r \cup (pq) \cup \phi$
$= EC(pqr) = pqr$

$(qr), a) = (q,a) \cup (r,a)$
$= p \cup \phi = EC(p) = pqr$

$(qr, b) = (q,b) \cup (r,b)$
$= r \cup \phi = EC(r) = r$

$(qr, c) = (q,c) \cup (r,c)$
$= (pq) \cup \phi$
$= EC(pq) = pqr$

$(\gamma, a) = \phi$
$(\gamma, b) = \phi$
$(\gamma, c) = \phi$



DFA

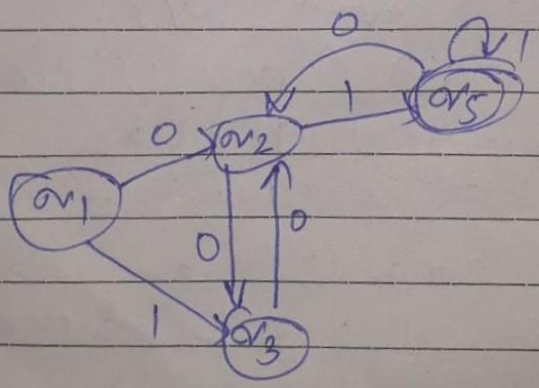
Section - B

2) Minimize the following DFAs

(a)

	0	1
→α_1	α_2	α_3
α_2	α_3	α_5
*α_3	α_4	α_3
α_4	α_3	α_5
*α_5	α_2	α_5

Solve

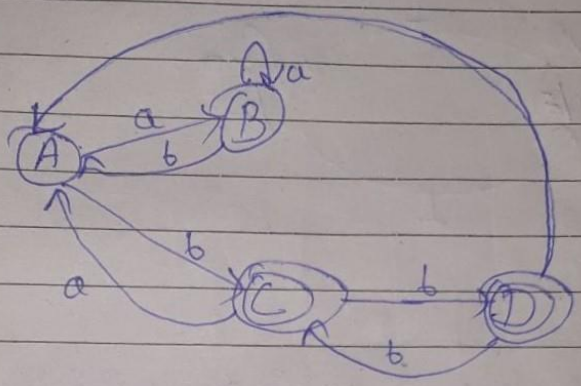


$\alpha_2 \equiv \alpha_4$

So all the ~~transition~~ outgoing transition of α_4 is Remove and incoming transition move to α_2

(B)

	a	b
→A	B	C
B	E	F
*C	A	D
*D	F	C
E	B	A
F	E	D.



A = F
B = E

So all the Outing transaction of F and E Remove and incoming transaction move to A and B.

2) Convert the following NFA to DFA and minimize. the Number of States in the DFA

NFA TT

	a	b	c	ε
→q_0	ϕ	q_1	q_2	q_1, q_2
q_1	q_0	q_2	$q_0 q_2$	ϕ
*q_2	ϕ	ϕ	ϕ	ϕ

DFA TT

	a	b	c	ε
→q_0	ϕ	q_1	q_2	q_1, q_2
q_1	q_0	q_2	$q_0 q_2$	ϕ
q_2	ϕ	ϕ	ϕ	ϕ
$q_0 q_2$	ϕ	q_1	q_2	q_1, q_2

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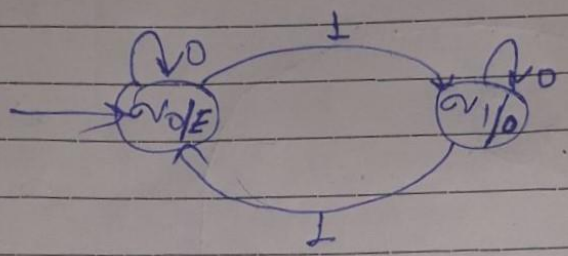
Section - I

1) Construct a Moore machine that Reads input from {0,1} and output E, if Number of 1's is even and O if number of 1's is odd.

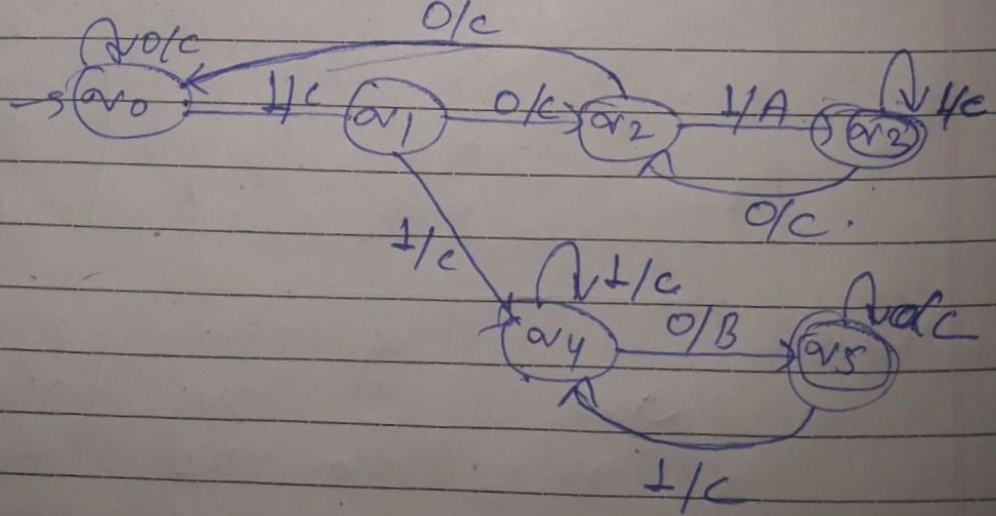
Ans



2) Construct a Melay machine which reads the input from {0,1} and produce the following output

① if input ends in 101 output is A
② if input ends in 110 output is B
③ Other the output is C.

Ans



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3) Convert the following Moore machine to Mealy machine.

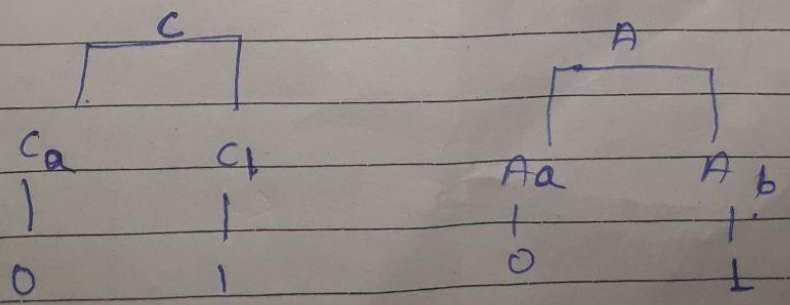
	0	1	output
→A	A	B	0
B	A	C	0
C	A	C	1

Ans Mealy machine.

	0	out	1	out
→A	A	0	B	0
B	A	0	C	1
C	A	0	C	1

4) Convert the following Mealy machine in to equivalent moore machine.

	a	out	b	out
A	C	1	D	0
B	A	0	B	1
C	B	1	C	1
D	C	0	A	1



	a	out	B	out
A_a	C_b	1	D	0
A_b	C_b	1	D	0
B	A_a	0	B	1
C_a	B	1	C_b	1
C_B	B	1	C_b	1
D	C_a	0	A_b	1

Moore machine.

	a	b	output
A_a	C_b	D	0
A_b	C_b	D	1
B	A_a	B	1
C_a	B	C_b	0
C_B	B	C_b	1
D	C_a	A_b	0