Question # 01

ε-Closure of all States

ε-Closure of $0 = \{0, q_1, q_2, q_6, q_4, q_7\}$

" " " $q_1 = \{q_1, q_2, q_4, q_6, q_7\}$

" " " $q_2 = \{q_2\}$

" " " $q_3 = \{q_3, q_6, q_7\}$

" " " $q_4 = \{q_4\}$

" " " $q_5 = \{q_5, q_6\}$

" " " $q_6 = \{q_6, q_7\}$

" " " $q_7 = \{q_7\}$

" " " $q_8 = \{q_8\}$

" " " $q_9 = \{q_9\}$

" " " $q_{10} = \{q_{10}\}$

ε-Closure of State 0 → A State

$\delta(A, a) = (\delta(0,a) \cup \delta(q_1, a) \cup \delta(q_2, a) \cup (q_6, a) \cup (q_4, a) \cup (q_7, a))$

$\Rightarrow (\phi \cup \phi \cup q_3 \cup \phi \cup \phi\, q_8)$

$\delta(A, a) = (q_3, q_8) = B$ State

$\delta(A, b) = (\delta(0, b) \cup \delta(q_1, b) \cup \delta(q_2, b) \cup (q_6, b) \cup (q_4, b) \cup (q_7, b))$

$= q_5 = C$ State

$\delta(B, a) = \delta(q_3, a) \cup \delta(q_8, a)$

$= (\phi \cup \phi) = \phi = X$ Dead State

$\delta(B, b) = (\delta(q_2, b) \cup \delta(q_6, b))$

$= \phi \cup q_9 = q_9$ ⇒ State

$\delta(C, a) = \delta(q_5, a) = \phi$

$\delta(c, b) = \delta(q_5, b) = \phi$

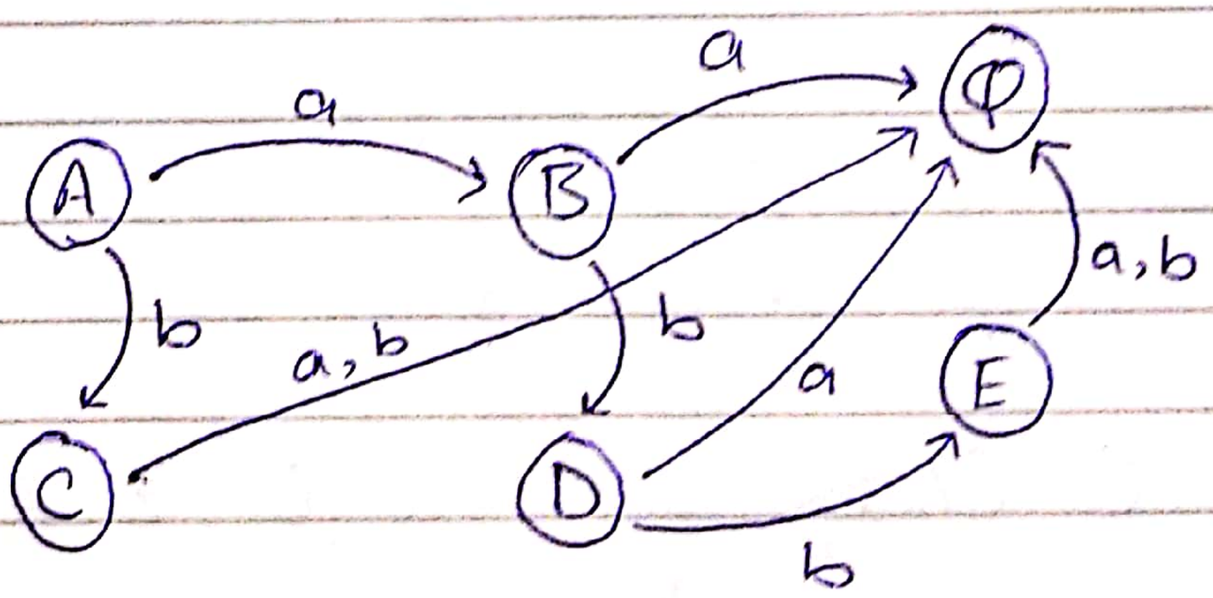
$\delta(D, a) = \delta(q_9, a) = \phi$

$\delta(D, b) = \delta(q_9, b) = \phi\, q_{10}$ ⇒ E

$\delta(E, a) = \delta(q_{10}, a) = \phi$

$\delta(E, b) = \delta(q_{10}, b) = \phi$

Now DFA is

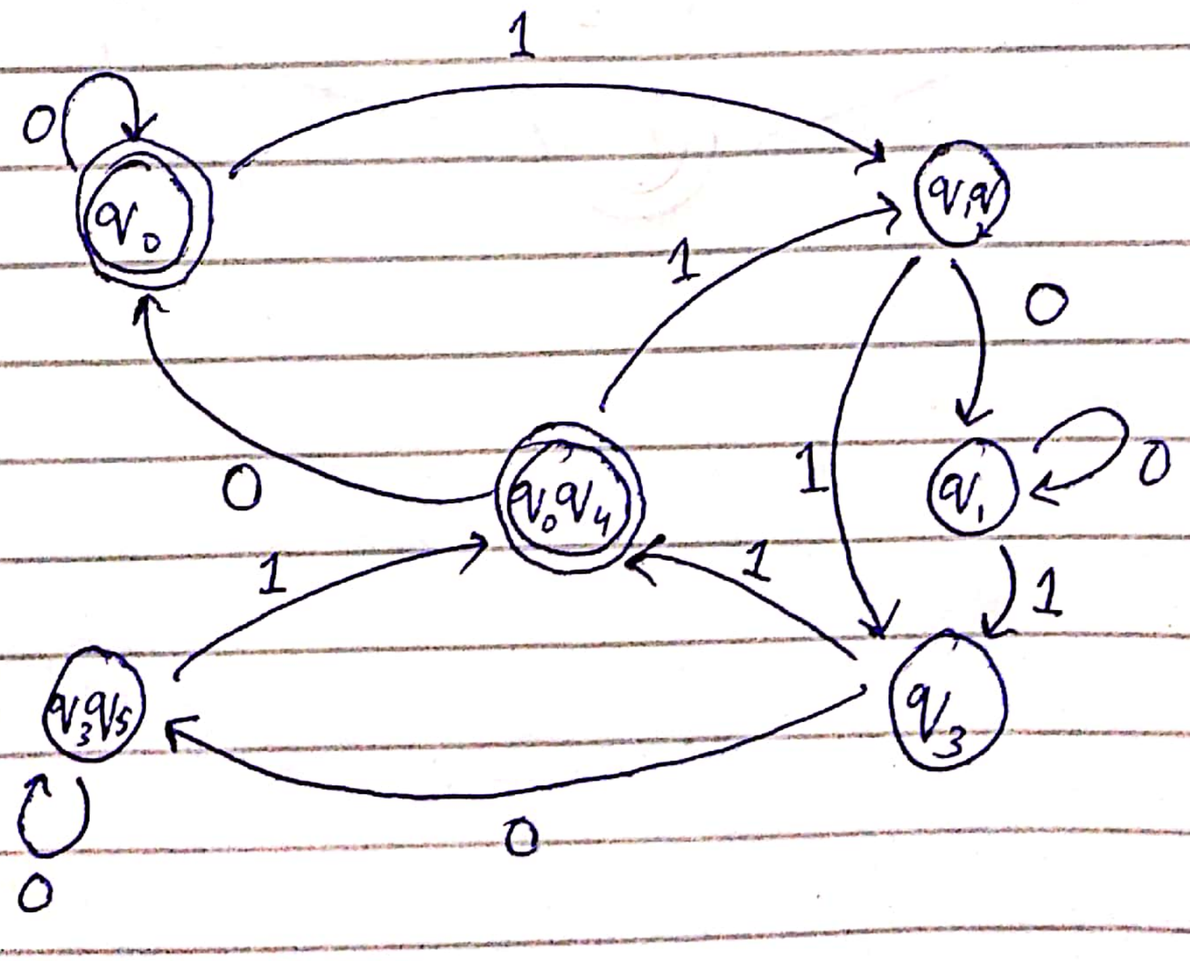


Question # 02

(1)

	0	1
→ q_0	q_0	$q_1 q_2$
q_1	q_1	q_3
q_2	–	q_3
q_3	$q_3 q_5$	$q_0 q_4$
q_4	–	q_2
q_5	q_3	–

	0	1
→ q_0	q_0	$q_1 q_2$
$q_1 q_2$	q_1	q_3
q_1	q_1	q_3
q_3	$q_3 q_5$	$q_0 q_4$
$q_3 q_5$	$q_3 q_5$	$q_0 q_4$
$q_0 q_4$	q_0	$q_1 q_2$



Question # 03

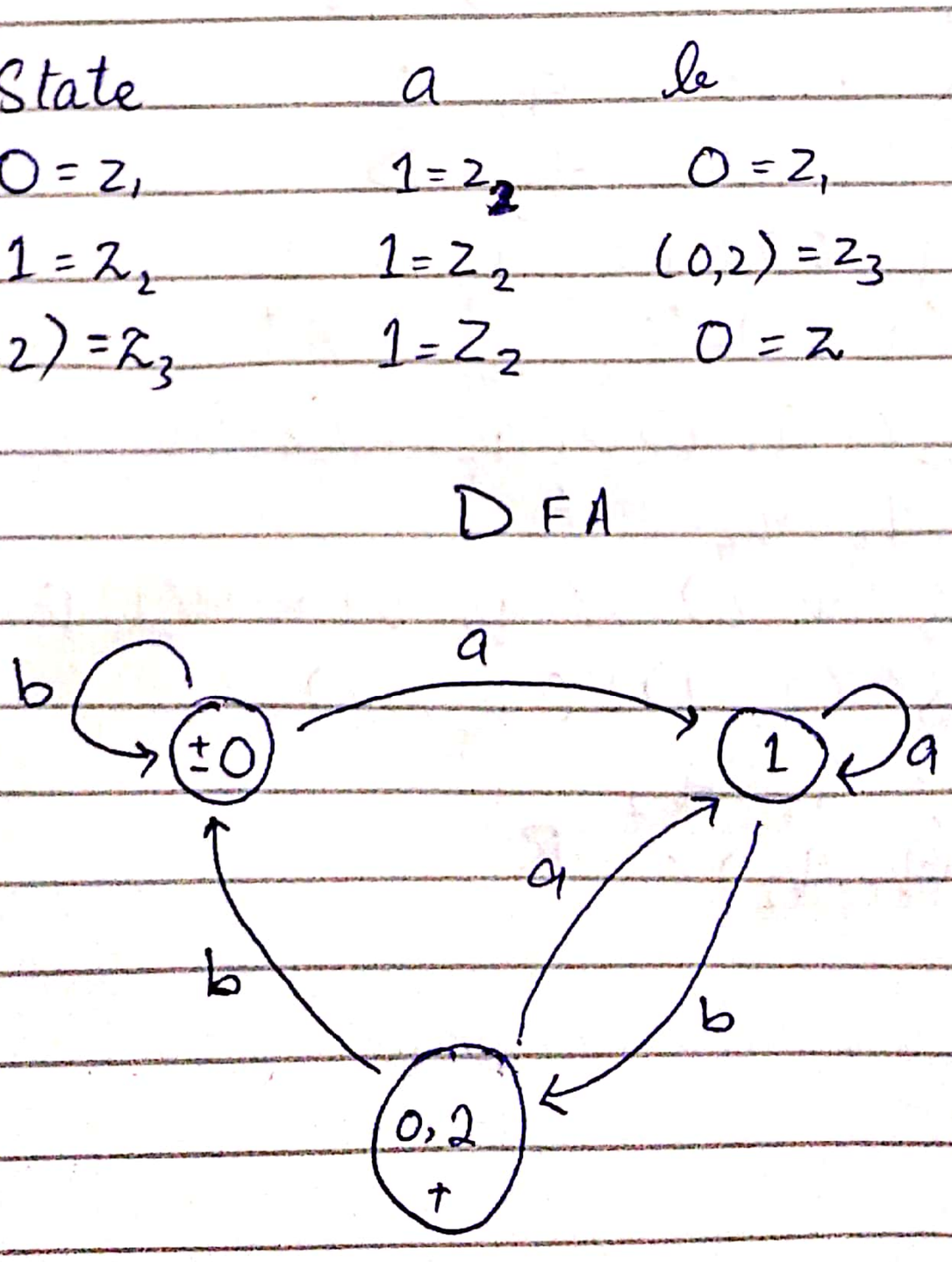
NFA → DFA

State	0	1
→ 0	1	0
1	1	0,2
2	1	φ
3	0	2
4+	φ	3,4

DFA Table

State	a	le
→ $0 = Z_1$	$1 = Z_2$	$0 = Z_1$
$1 = Z_2$	$1 = Z_2$	$(0,2) = Z_3$
$(0,2) = Z_3$	$1 = Z_2$	$0 = Z$

DFA



Question # 02

ε- Closure of $q_0 = \{q_0\}$

" " " $q_0' = \{q_1, q_2\}$

" " " $q_2 = \{q_2\}$

" " " $q_3 = \{q_3\}$

" " " $q_4 = \{q_4, q_0\}$

" " " $q_5 = \{q_5\}$

$q_0 \Rightarrow$ A State

$\delta(A, 0) = \delta(q_0, 0) = A \quad q_0$ +

$\delta(A, 1) = \delta(q_0, 1) = (q_1, q_2) = B$

$\delta(B, 0) = \delta(q_1, 0) \cup (q_2, 0) \Rightarrow q_1 C$ State

$\delta(B, 1) = q_3 \cup q_3 = q_3 \Rightarrow D$

$\delta(C, 0) = \delta^3(q_1, 0) = {}^3q_1 = C$

$\delta(C, 1) = \delta(q_1, 1) = q_3 = D$

$\delta(D, 0) = (q_3, 0) = (q_3, q_5) = E$

$\delta(D, 1) = (q_3, 1) = (q_0, q_4) = F^+$

$\delta(E, 0) = \delta((q_3, 0) \cup (q_5, 0)) = (q_3, q_5) = E$

$\delta(E, 1) = q_0, q_4 = F$

$\delta(F, 0) = \delta(q_0, 0) \cup (q_4, 0) = q_0 \cup \phi = q_0 \Rightarrow A$

$\delta(F, 1) = \delta((q_0, 1) \cup (q_4, 1))$

$= q_1, q_2 \cup q_2$

$= (q_1, q_2) = B$

Question # 02 (Continue)

Now DFA is