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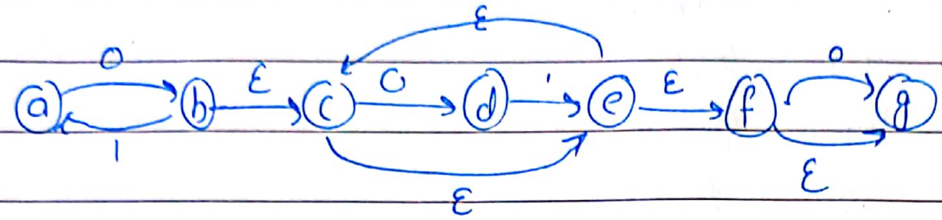
Tutorial - 2

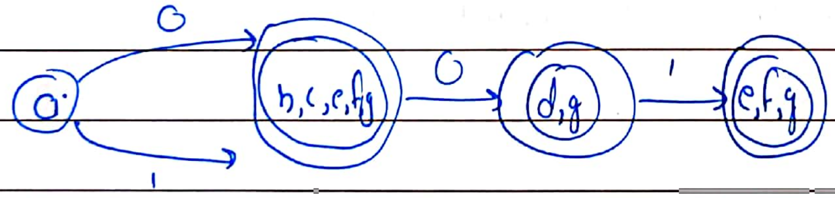
1]



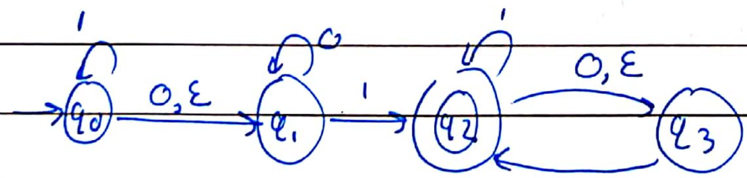
States	0	1	ε
→ a	b	b	-
b	-	-	c
c	d	-	e
e	-	-	c, f
f	g	-	g
* g	-	-	-

States for DFA :

States	0	1
a	b, c, e, f, g	-
b, c, e, f, g	d, g	-
d, g	-	e, f, g



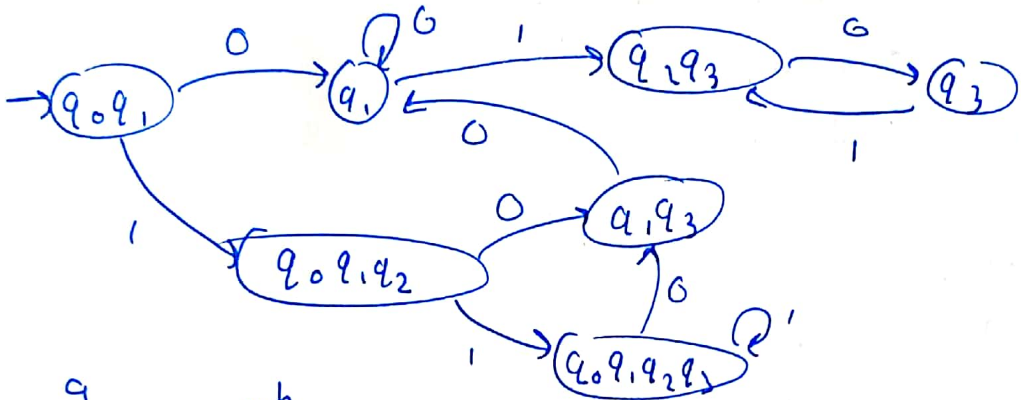
Q2]



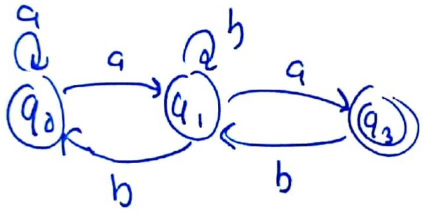
States	0	1	ε	ε-closure
q_0	q_1	q_0	q_1	$\{q_0, q_1\}$
q_1	q_1	q_2	-	$\{q_1\}$
q_2	q_3	q_2	q_3	$\{q_2, q_3\}$
q_3	-	q_2, q_3	-	$\{q_3\}$

DFA: States

States	0	1
$\rightarrow q_0q_1$	q_1	$q_0q_1q_2$
q_1	q_1	q_2q_3
$q_0q_1q_2$	q_1q_3	$q_0q_1q_2q_3$
q_2q_3	q_3	q_2q_3
q_2q_3	q_3	q_2q_3
q_1q_3	q_1	q_2q_3
$q_0q_1q_2q_3$	q_1q_3	$q_0q_1q_2q_3$
q_3	-	q_2q_3



Q3]



$q_2 = q_1 a$ — (1) $\qquad q_1 = q_0 a + q_1 b + q_2 b$ — (2)

$q_0 = q_0 a + q_1 b + \varepsilon$ — (3)

$q_1 = q_0 a + q_1 b + q_1 ab$ $\qquad$ (1) & (2)

$q_1 = q_0 a + q_1 (b+ab)$

$\therefore q_1 = q_0 a (b+ab)^*$ $\qquad$ Arden' therom

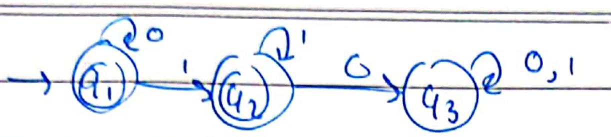
$q_0 = \varepsilon + q_0 a + (q_0 a (b+ab)^*) b$

$\therefore q_0 = \varepsilon ((a + a (b+ab)^*) b)^*$

$\therefore$ final state:

$q_2 = q_1 a = (q_0 a (b+ab]^*) a = (a + a (b+ab)^* b)^* (a (b+ab)^* a)$

Q4]



$q_3 = q_3 0 + q_3 1 + q_2 0 = q_3(0+1) + q_2 0$ —(1)

$q_2 = q_1 1 + q_2 1$ (2)

$q_1 = q_1 0 + \varepsilon$ (3)

$q_3 = q_2 0 (0+1)^*$ by Arden's thm

$q_1 = \varepsilon (0)^*$ — " —

$q_2 = \varepsilon (0)^* + q_2 1$

$= 0^* 1^*$

Final state $= q_1 + q_2 = 0^* + 0^* 1^*$

Q5]

i) $L = \{ww \mid w \in (0,1)^*\}$

L is regular then pumping length = p

let $s = 0^p, 0^p 1$ let $p = 4$

$s = \underbrace{00}_{x}\ \underbrace{00}_{y}\ \underbrace{100001}_{z}$ $xy^2z = 000000100001 \notin L$

here $|y| > 1$

$|xy| \leq p$

∴ L is not regular.

ii) $L = \{a^n b^n c^n \mid n \geq 1\}$ assume L is regular

∴ It has pumping length p let $s = a^p b^p c^p$, $p = 4$

$s = \underbrace{aa}_{x}\ \underbrace{aa}_{y}\ \underbrace{bbbbcccc}_{z}$ $xy^2z = aaaaaa\ bbbb\ cccc \notin L$

here $|y| > 0$ & $|xy| < p$

∴ L is not regular.