Homework 6

1.

	0	1
a	b	f
b	g	c
*c	a	c
e	h	f
f	c	g
g	g	e
h	g	c

(a,b) 0 (b,g)
(a,e) 0 (b,h)
(a,e) 1 (f,f)
(c,h) 0 (a,g)
(c,h) 1 (c,c)
(b,c) 0 (g,a)
(b,c) 1 (c,c)
(e,f) 1 (f,g)
(e,g) 0 (h,g)
(e,g) 1 (f,e)

[b,c,h] [a,e,g] [f] [c]
0-1 equivalence states

[b,h] [c] [a,e] [g] [f] [c]
3 equivalence states

(b,c) 1 (c,c)
(b,h) 0 (g,g)
(b,h) 1 (c,c)
(c,h) 0 (c,c)
(a,e) 0 (b,h)
(a,e) 1 (f,f)

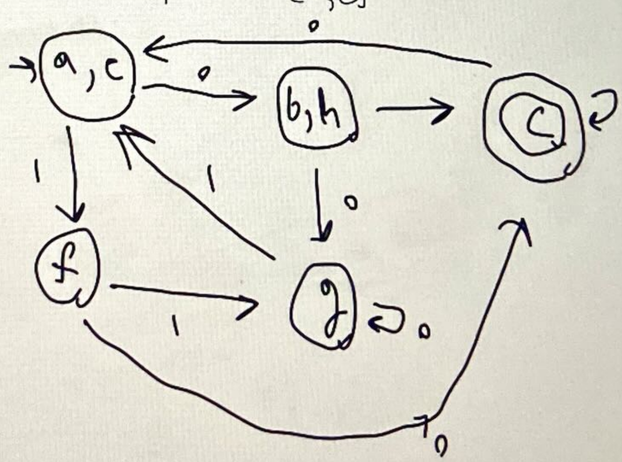
[b,c,h] [a,e] [g] [f] [c]
0-2 equivalence states

(b,c) 0 (g,a)
(b,c) 1 (c,c)
(a,e) 0 (b,h)
(a,e) 1 (f,f)
(c,h) 0 (a,g)
(c,h) 0 (c,c)

(b,h) 0 (g,g)
(b,h) 1 (c,c)
(a,e) 0 (b,h)
(a,e) 1 (f,f)

equivalence states are equal

	0	1
[a,e]	[b,h]	f
[b,h]	g	c
*c	[a,e]	c
f	c	g
g	g	[a,e]



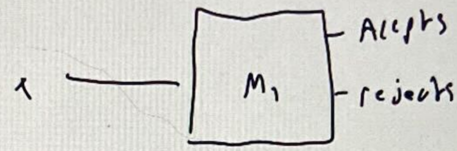
2.

if M_1 → accepted

M_2 → rejected

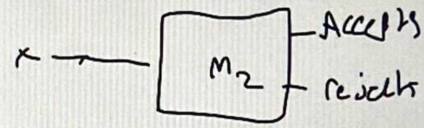
x → accepted

M1



if M_1 → rejected

→ 2n Stage



if M_2 → accepts

x → accepted

if M_2 → rejects

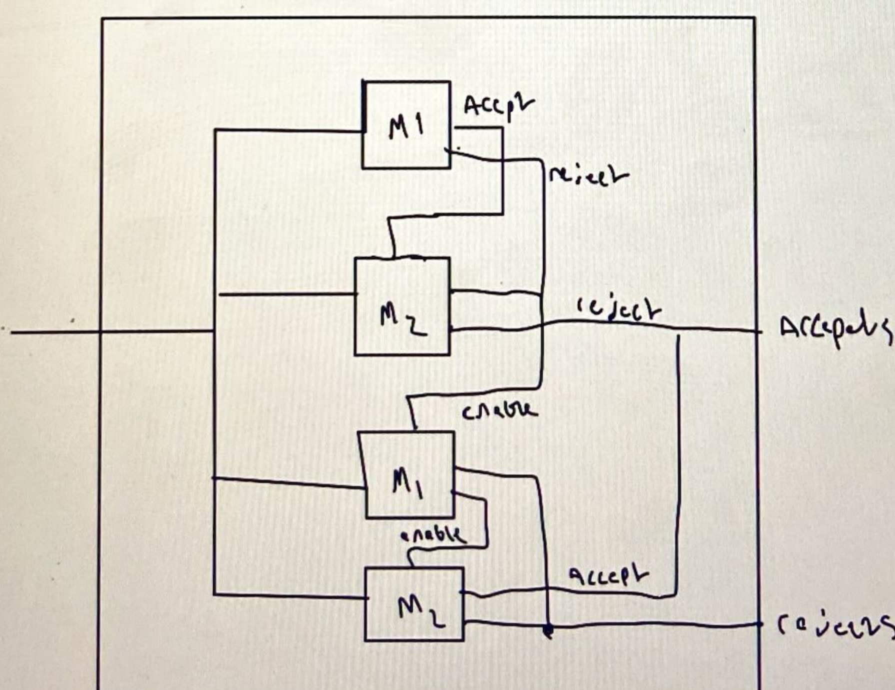
x → rejects

if M_1 and M_2 → accepted

x → rejected

*

M_1 and M_2 must be constant



3.

Show that $L^R = \{x^R : x \in L\}$ is regular if L is regular.

1. L be regular, $M = (Q, \Sigma, \delta, q_0, \{q_f\})$

2. $M' = (Q, \Sigma, \delta, q_f, \{q_0\}\}$, where δ' is δ with the orientation of arcs

3. There is a path from q_0 to q_f in M if and only if there is a path from q_f to q_0 in M'

4. Hence $L(M') = L'$

4.

* Not exactly sure *

For every state S in M with the property that there is a path from S to an accepting state, make S a final state in M', thus M' now accepts those strings that are accepted by M.

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I think this is how it should work

5.

$\text{Half}(L) = \{x : \text{for some } y, xy \in L \text{ and } |x| = |y|\}$

is regular if L is regular.

For every accepting state $f \in F$ in DFA $M = (Q, \Sigma, \delta, q_0, F)$ let length of path from starting state q_0 to accepting state $f = n$.

n accepts state in $N = (Q, \Sigma, \delta, q_0, F_1)$

every even value of $x + ky$, the value of $(x + ky)/2$ is within the range of $2|Q|$ because the shortest path length from state q_0 to any other state in $M = (Q, \Sigma, \delta, q_0, F)$ is $|Q|$.

if z is in range of $(x + k_y)/2$ for $0 \leq k \leq 2|Q|$ then any state q_1 which are in path from state q_0 to state $f \in F$ at a distance z from q_0 will be taken when accepting state in $N = (Q, \Sigma, \delta, q_0, F_1)$

The DFA is finite size, there will be a finite number of states and finite number of loops. we compute the possible length from range 1 to range $2|Q|$

every regular language has a DFA and since DFA is half(L), language half(L) is regular.