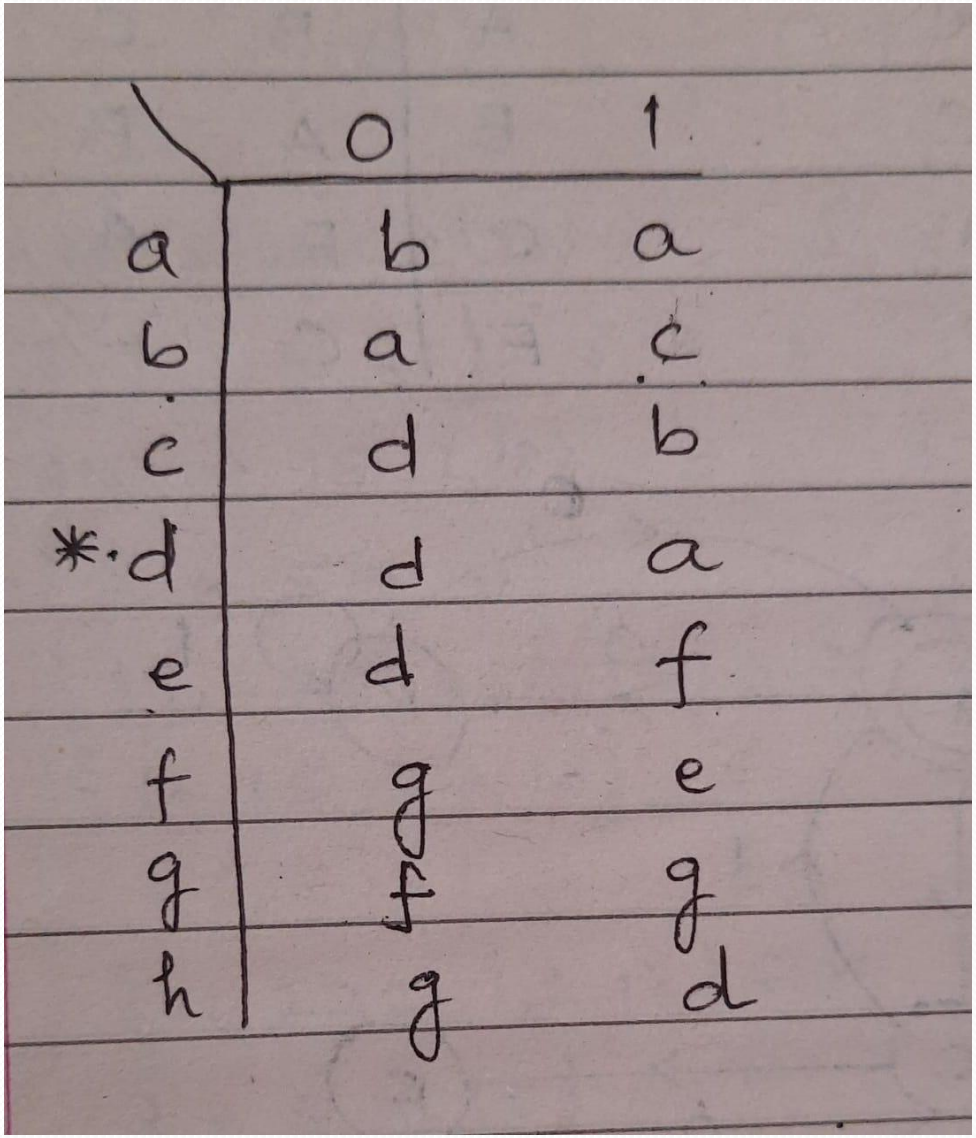
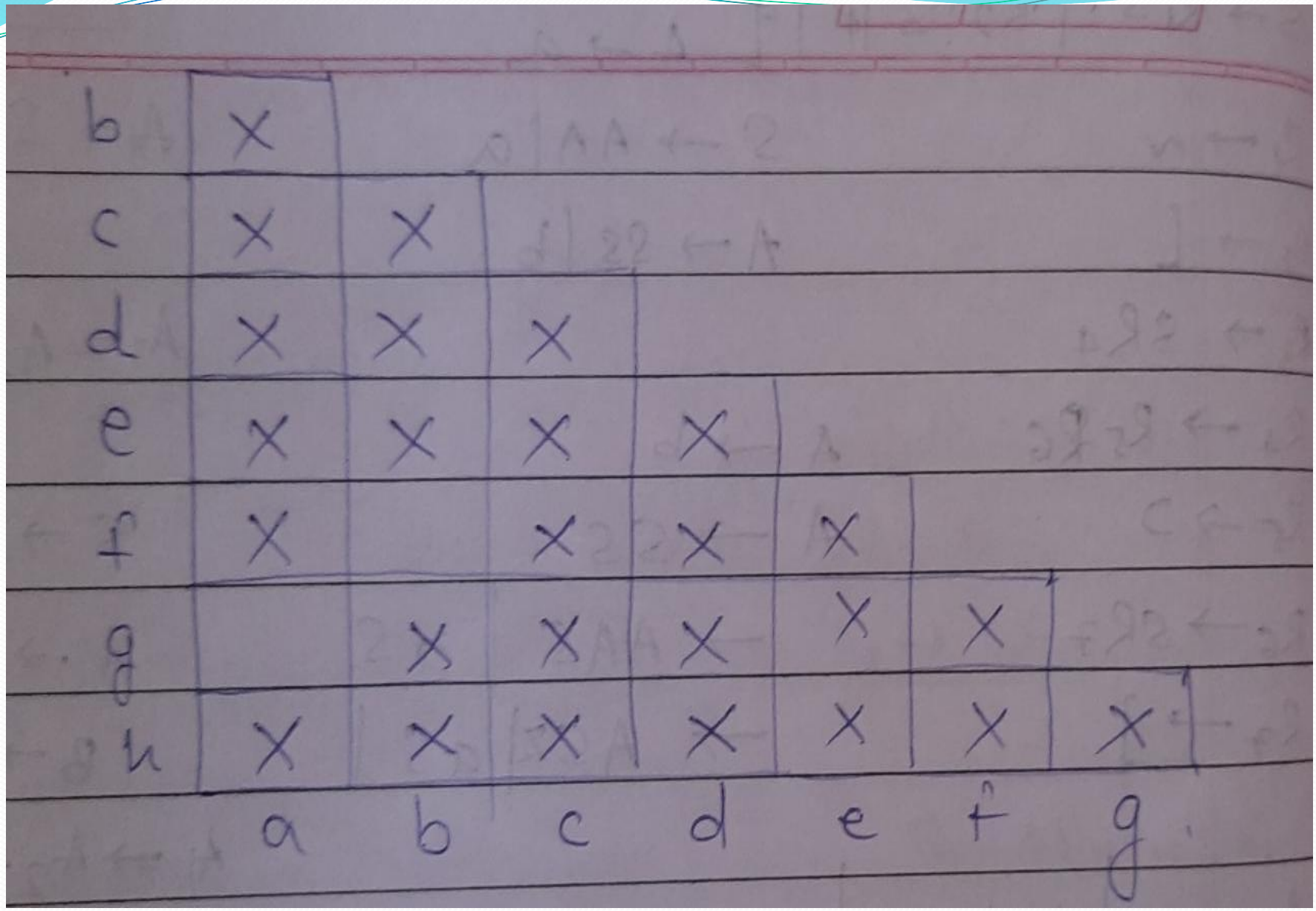
# Minimization of DFA

My-Hill Nerode Theorem

- Minimize the given DFA



| | 0 | 1 |
|---|---|---|
| a | b | a |
| b | a | c |
| c | d | b |
| *d | d | a |
| e | d | f |
| f | g | e |
| g | f | g |
| h | g | d |


b X
c X X
d X X X
e X X X X
f X X X X
g X X X X X
h X X X X X X X
a b c d e f g

$(a, c) \longrightarrow (a, b)$

$(b, f) \longrightarrow (a, g)$

$(c, e) \longrightarrow (b, f)$

$\therefore$ (a, g), (b, f), and (c, e) are equivalent states.

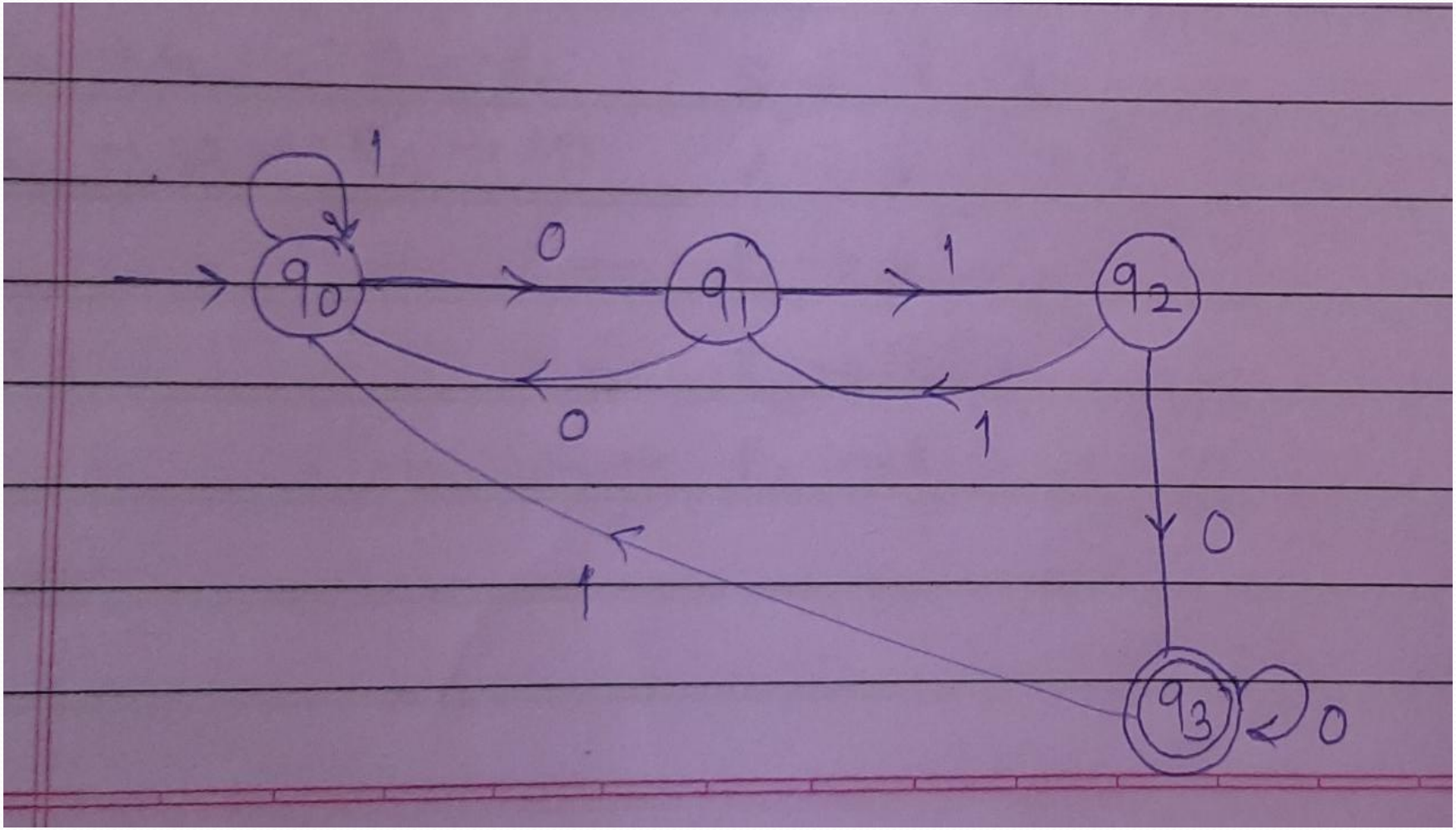
i.e., $a \equiv g$

$b \equiv f$

$c \equiv e$.

Considering these equivalences, the $\delta'$ can be framed as:

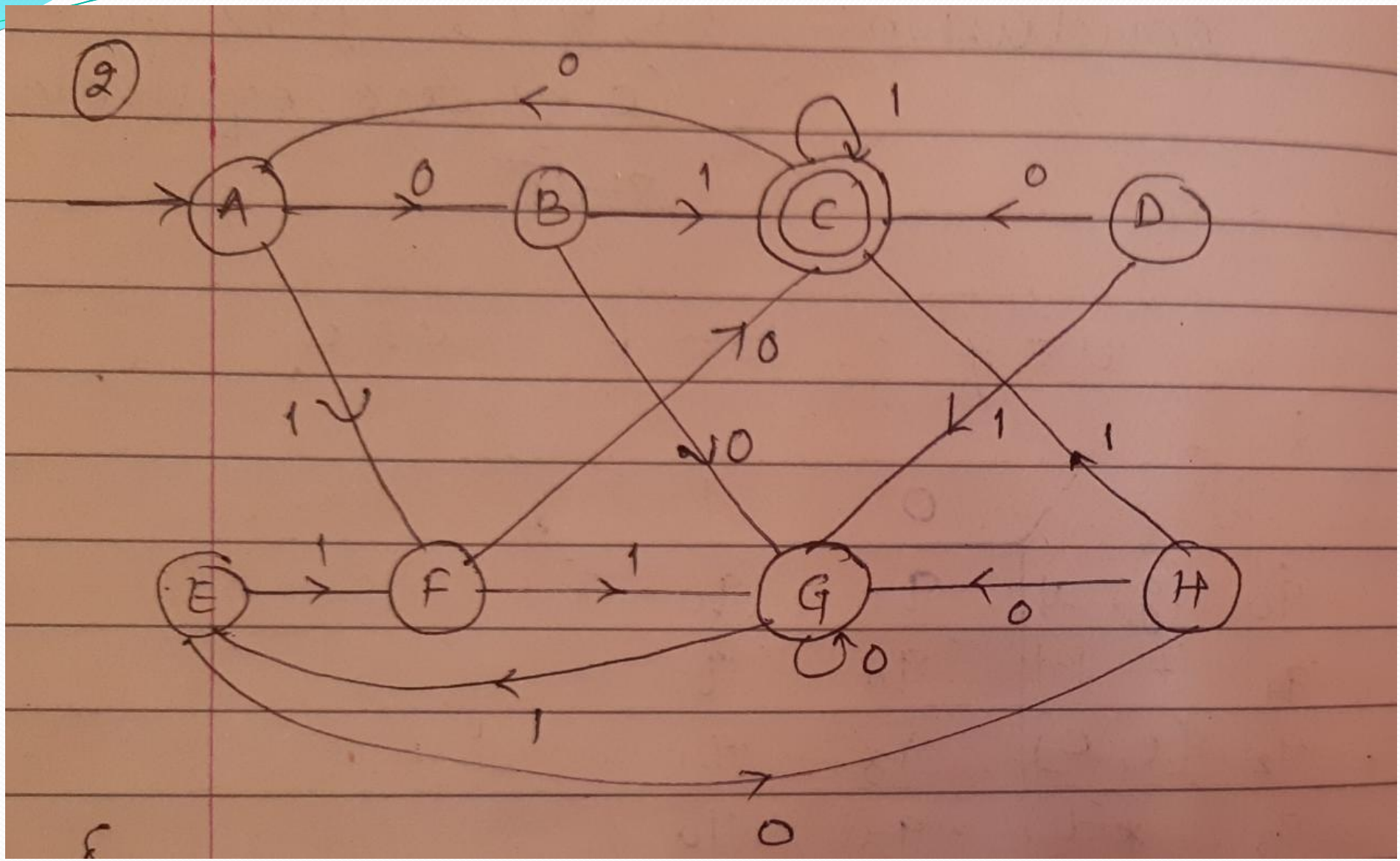
| $\delta'$ | 0 | 1 |
|---|---|---|
| $q_0$ [a, g] | $q_1$ | $q_0$ |
| $q_1$ [b, f] | $q_0$ | $q_2$ |
| $q_2$ [c, e] | $q_3$ | $q_1$ |
| * $q_3$ d | $q_3$ | $q_0$ |
| $q_4$ h | $q_0$ | $q_3$ |


1
0
1
$q_0$
$q_1$
$q_2$
0
1
0
1
$q_3$
0

State $q_4$ is unreacheable. Hence is unwanted

$\therefore$ final DFA becomes -

$M = (\{q_0, q_1, q_2, q_3\}, \{0, 1\}, \delta', q_0, \{q_3\})$


2
A
B
C
D
E
F
G
H
0
1

8

| | 0 | 1 |
|---|---|---|
| A | B | F |
| B | G | ~~G~~ C |
| C | ~~A~~ | G |
| D | C | G |
| E | H | F |
| F | C | G |
| G | G | E |
| H | G | C |

$A \equiv E$

$B \equiv H$

$D \equiv F$

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| B | X | | | | | |
| C | X | X | | | | |
| D | X | X | X | | | |
| E | | X | X | X | | |
| F | X | X | X | | X | |
| G | X | | X | X | X | X |
| H | X | | X | X | X | X |

| | 0 | 1 |
|---|---|---|
| $q_0$ (A, e) | $q_1$ | $q_2$ |
| $q_1$ (B, H) | $q_4$ | $q_3$ |
| $q_2$ (D, F) | $q_3$ | $q_4$ |
| $q_3$ *C | $q_0$ | $q_3$ |
| $q_4$ G | $q_4$ | $q_0$ |