# Introduction to the Theory of Computation
## Chapter 1 Exercises

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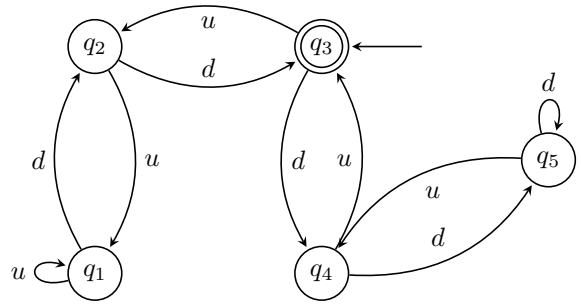
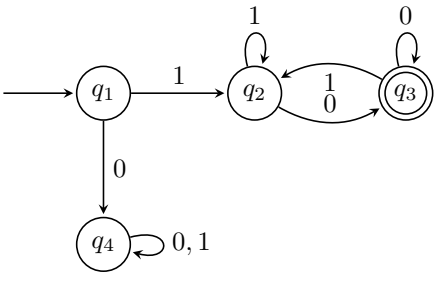
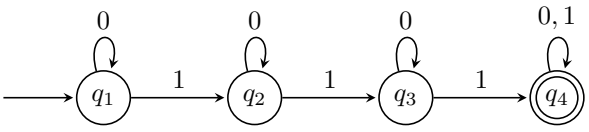
1. (a) $q_1$
   (b) $\{q_2\}$
   (c) $q_1$
   (d) $\{q_1, q_4\}$
   (e) $q_1, q_2, q_3, q_1, q_1$
   (f) No
   (g) Yes

2. $M_1 = (\{q_1, q_2, q_3\}, \{a, b\}, \delta, q_1, \{q_2\})$
   where $\delta(q_1, a) = q_2, \delta(q_1, b) = q_1, \delta(q_2, \text{.}) = q_3, \delta(q_3, a) = q_2, \delta(q_3, b) = q_1$
   $M_2 = (\{q_1, q_2, q_3, q_4\}, \{a, b\}, \delta, q_1, \{q_1, q_4\})$
   where $\delta(q_1, a) = q_q, \delta(q_1, b) = q_2, \delta(q_2, a) = q_3, \delta(q_2, b) = q_4, \delta(q_3, a) = q_2, \delta(q_3, b) = q_1, \delta(q_4, a) = q_3, \delta(q_4, b) = q_4$

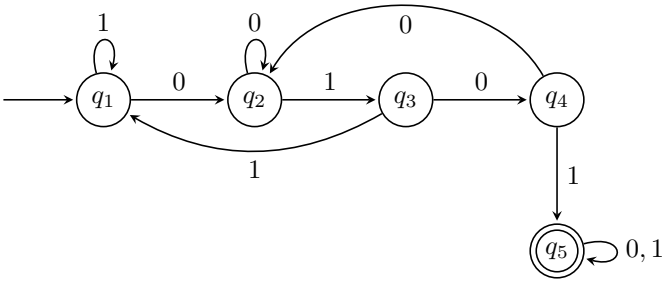
3. 


4. (a) 

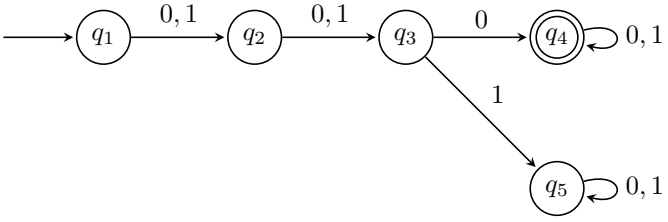
(b)


0
0
0
0, 1
1
1
1
$q_1$
$q_2$
$q_3$
$q_4$

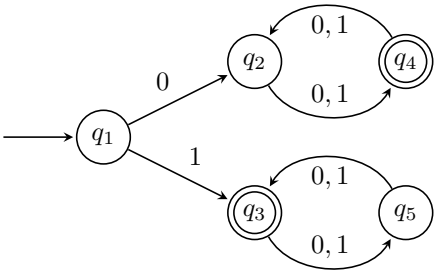
(c)


1
0
0
0
1
0
1
1
$q_1$
$q_2$
$q_3$
$q_4$
$q_5$
0, 1

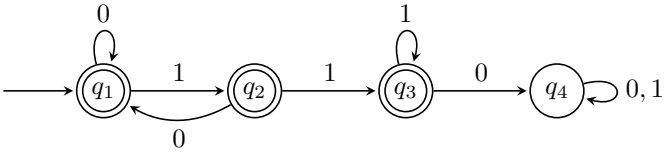
(d)


0, 1
0, 1
0
0, 1
1
$q_1$
$q_2$
$q_3$
$q_4$
$q_5$
0, 1

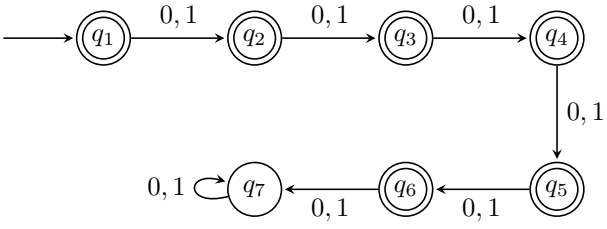
(e)


0, 1
0
0, 1
1
0, 1
0, 1
$q_1$
$q_2$
$q_3$
$q_4$
$q_5$

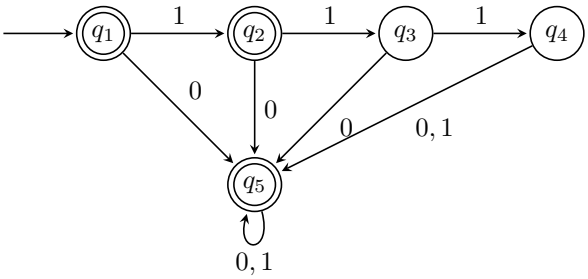
(f)


0
1
1
1
0
0, 1
0
$q_1$
$q_2$
$q_3$
$q_4$

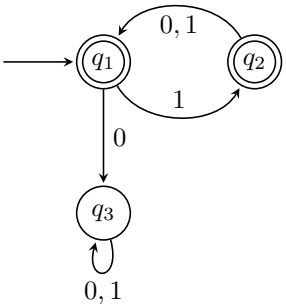
(g)


0, 1
0, 1
0, 1
0, 1
0, 1
0, 1
0, 1
0, 1
$q_1$
$q_2$
$q_3$
$q_4$
$q_5$
$q_6$
$q_7$

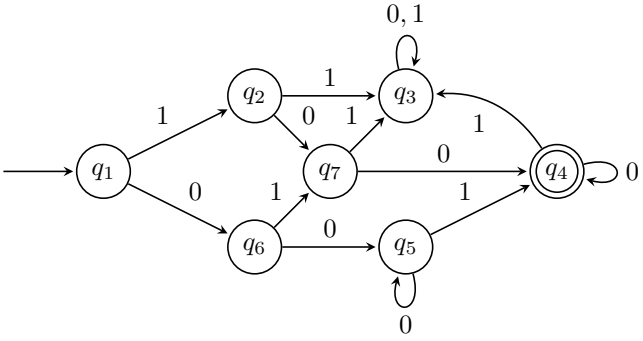
(h)


$q_1$
$q_2$
$q_3$
$q_4$
$q_5$
1
1
1
0
0
0
0, 1
0, 1

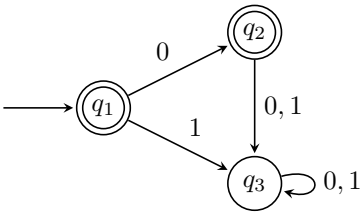
(i)


$q_1$
$q_2$
$q_3$
0, 1
1
0
0, 1

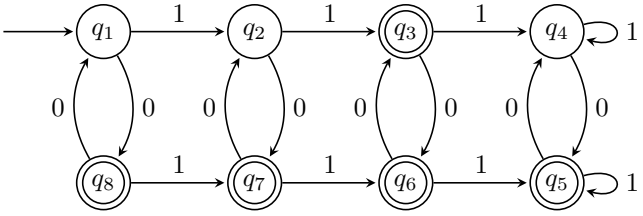
(j)


$q_1$
$q_2$
$q_3$
$q_4$
$q_5$
$q_6$
$q_7$
0, 1
1
0
1
1
0
0
1
1
0
0

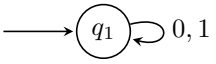
(k)


$q_1$
$q_2$
$q_3$
0
1
0, 1
0, 1

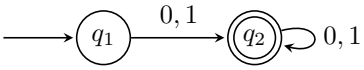
(l)


$q_1$
$q_2$
$q_3$
$q_4$
$q_5$
$q_6$
$q_7$
$q_8$
1
1
1
1
1
1
1
0
0
0
0
0
0
0
0
1
1

(m)




(n)




5. (a) **TODO**