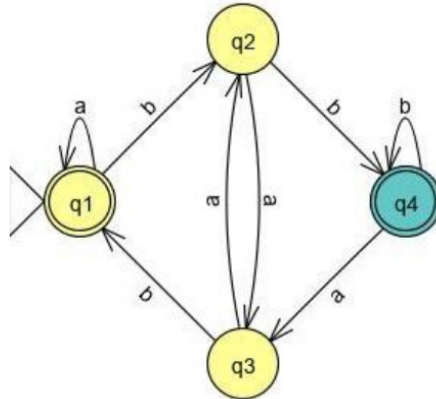


1. [5 pts] For the following DFA, answer questions.



- 1) Which state is the initial/start state?
- 2) Which state(s) is(are) accepting state(s)?
- 3) Write state sequence for input string *aabb*, does the DFA accept string *aabb*?
- 4) Write state sequence for input string *aabaaba*, does the DFA accept string *aabaaba*?
- 5) Does above DFA accept the empty string  $\epsilon$ ?

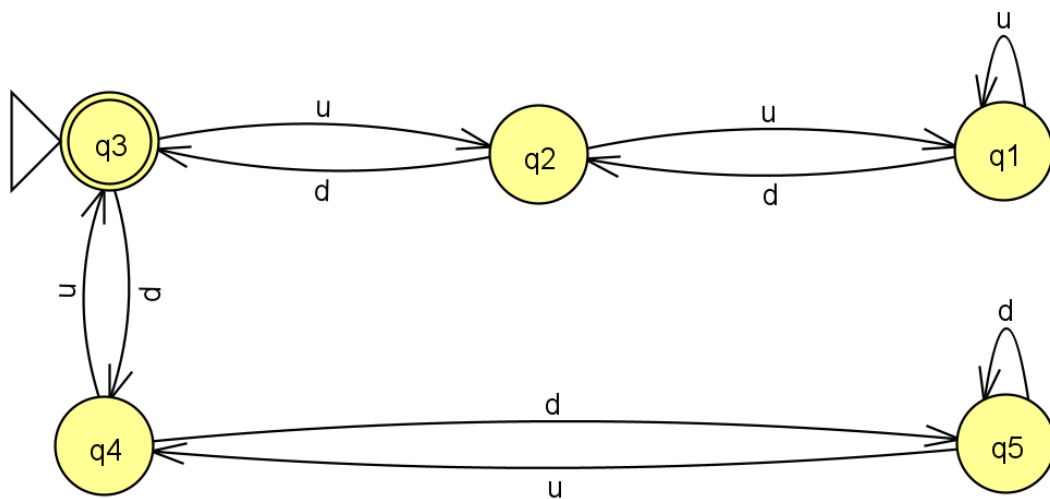
1. The initial state is q1
2. The accepting states are the following: q1, q4
3.  $aabb = (q1, aabb) > (q1, abb) > (q1, bb) > (q2, b) > (q4, "") > \textbf{accept}$
4.  $Aabaaba = (q1, aabaaba) > (q1, abaaba) > (q1, baaba) > (q2, aaba) > (q3, aba) > (q2, ba) > (q4, a) > (q3, "") > \textbf{rejected}$
5. Yes, an empty string is **accepted**

2. [2 pts] Given the formal description of a DFA  $M$  defined as below, using [JFLAP](https://www.jflap.org/jflaptmp/) (<https://www.jflap.org/jflaptmp/>, download JFLAP7.1.jar) to draw its state diagram (save it as .jpg file and paste it here)

$$M = (\{q_1, q_2, q_3, q_4, q_5\}, \{u, d\}, \delta, q_3, \{q_3\})$$

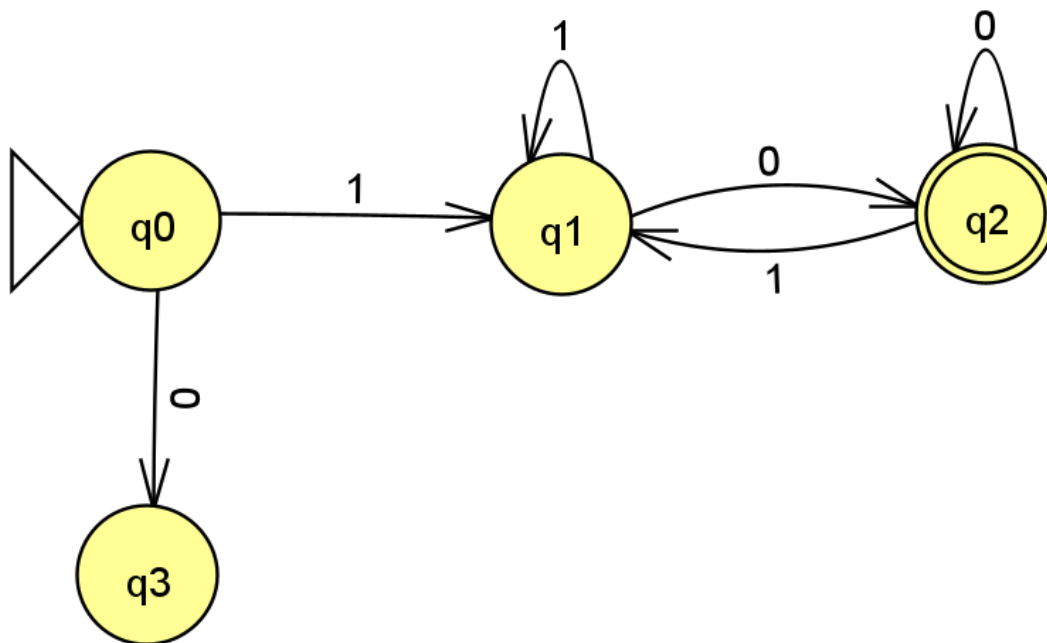
where the transition function  $\delta$  is defined as:

$\delta$	$u$	$d$
$q_1$	$q_1$	$q_2$
$q_2$	$q_1$	$q_3$
$q_3$	$q_2$	$q_4$
$q_4$	$q_3$	$q_5$
$q_5$	$q_4$	$q_5$



3. [5 pts] For the following language  $L$ , assume alphabet  $\Sigma = \{0, 1\}$ . [JFLAP](https://www.jflap.org/jflaptmp/) (<https://www.jflap.org/jflaptmp/>, download JFLAP7.1.jar) to draw its state diagram (save it as .jpg file and paste it here).

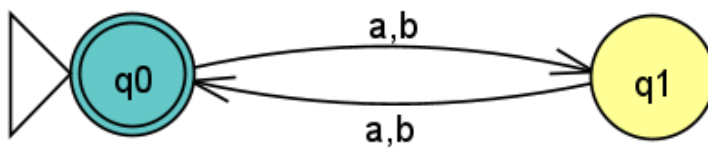
$$L = \{\omega \mid \omega \text{ begins with a 1 and ends with a 0}\}$$



4. [4 pts] The following language is the intersection of two simpler languages. First construct DFAs for the simpler languages, then combine them using the product construction described in Theorem 1.25 (textbook pp.66) to draw the state diagram (Use JFLAP) for the language given. Assume alphabet  $\Sigma = \{a, b\}$ .

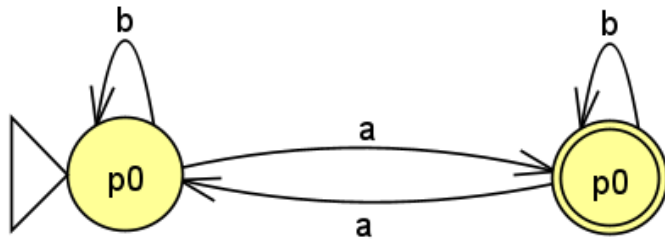
$L = \{\omega \mid \omega \text{ has even length and an odd number of } a\text{'s}\}$

$L_1 = w \text{ has an even length}$

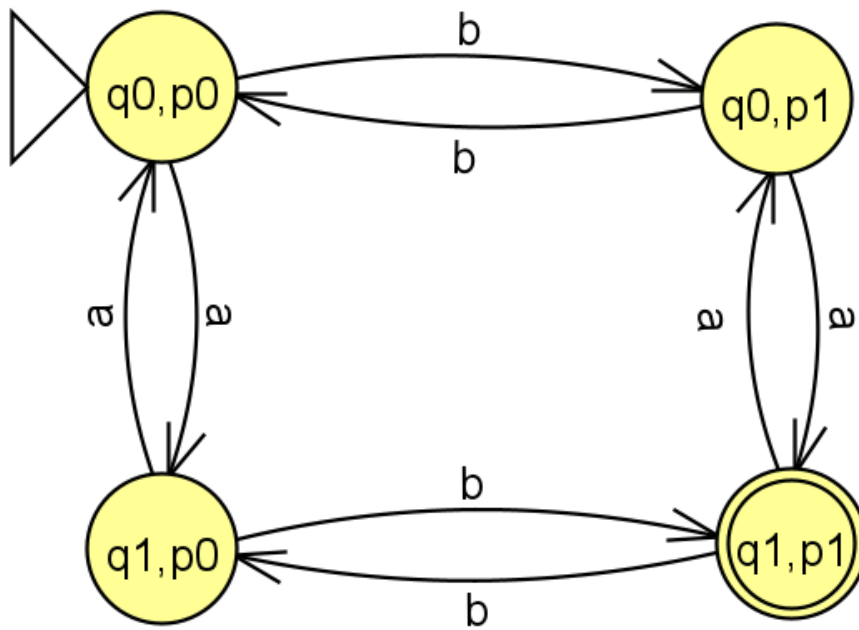


$L_2 = w \text{ has an odd number of } a\text{'s}$

The accepting state is supposed to be p1 its a typo



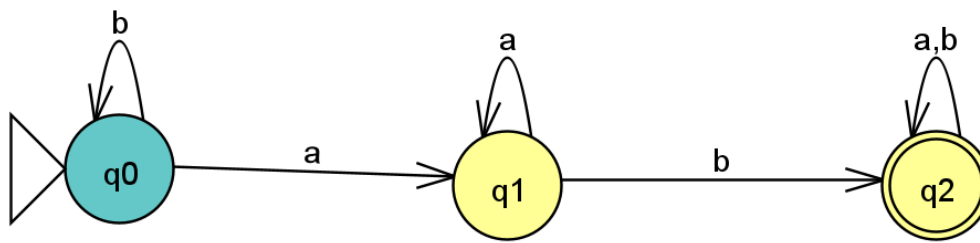
ANSWER L



5. [4 pts] The following language is the complement of a simpler language. First construct DFA for the simpler languages, then use it to give the state diagram of the language (use JFLAP). Assume alphabet  $\Sigma = \{a, b\}$ .

$L = \{\omega \mid \omega \text{ does not contain the substring } ab\}$

$L' = w \text{ does contain a substring } ab$



ANSWER for L

