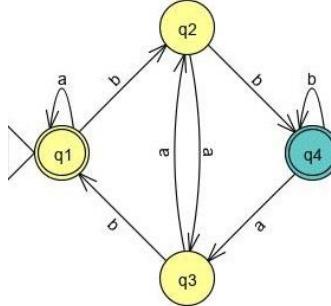


CSE 355: Intro to Theoretical Computer Science Recitation #2 (**Solution**)

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



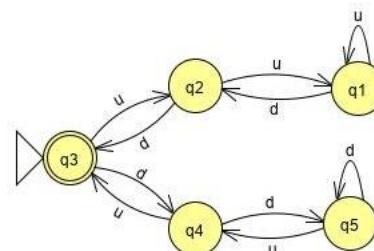
- 1) Which state is the initial/start state? **q₁**
- 2) Which state(s) is(are) accepting state(s)? **{q₁, q₄}**
- 3) Write state sequence for input string *aabb*, does the DFA accept string *aabb*?
q₁, q₁, q₂, q₄. Yes, it will be accepted by this DFA
- 4) Write state sequence for input string *aabaaba*, does the DFA accept string *aabaaba*?
q₁, q₁, q₂, q₃, q₂, q₄, q₃. No, since it ended at q₃ which is not an accepting state, it will be rejected by this DFA
- 5) Does above DFA accept the empty string ϵ ?
Yes. Since the initial state is also an accepting state.

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

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

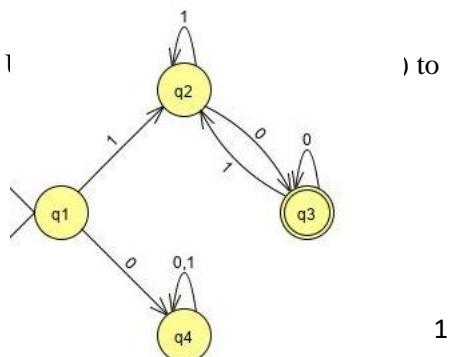
where the transition function δ is defined as:

δ	<i>u</i>	<i>d</i>
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 $\Sigma = \{0, 1\}$. draw its state diagram (save it as .jpg file and paste it here).

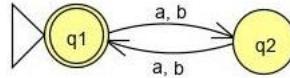
$$L = \{\omega \mid \omega \text{ begins with a } 1 \text{ and ends with a } 0\}$$



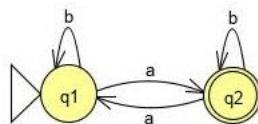
4. [4 pts] The following language is the intersection of two simpler languages. First construct DFAs for the simpler languages, then combine them using the product construction described in Theorem 1.25 (textbook pp.66) to draw the state diagram (Use JFLAP) for the language given. Assume alphabet $\Sigma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

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

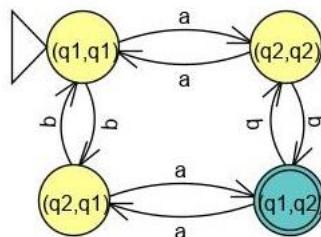
$L_1 = \{\omega \mid \omega \text{ has even length}\}$



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



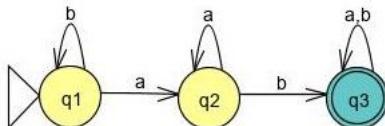
$L = L_1 \cap L_2 = \{\omega \mid \omega \text{ has even length AND an odd number of } a's\}$



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 $\Sigma = \{a, b\}$.

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

$\bar{L} = \{\omega \mid \omega \text{ contains the substring } ab\}$



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

