Recitation 1 - Deterministic Finite Automata

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My Expectations of You (1 / 2)

Recitations

If you come to recitation, come willing to work on problems and work with your classmates. This will be an active, not passive, recitation.

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- Learning happens by doing and explaining, learning doesn't happen by listening
- You don't need to know the answers, or even always understand the questions. Let me or your classmates know when you have questions.
- Be respectful of the contributions of others

My Expectations of You (2 / 2)

Homework

- Be neat, be thorough

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- Don't cheat

My Expectations of You (2 / 2)

Homework

- Be neat, be thorough
- Don't cheat
- Be prepared to answer questions about what you turn in

What You Can Expect of Me

- Give careful considerations to your input, if you are willing to give it
- Prompt responses to questions and grading of homework
- Anything else?

Half of you will be given Question cards and half of you will be given Answer cards related to yesterdays lecture. Wander the room introducing yourself as you go and find your match. Check with John after you think have found your match.

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- If you don't know the answer to your question or don't understand the notation, that is perfectly fine. Talk with your classmates and work through it together, someone knows the answer

What is the start state of M_1?

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$$q_1$$

What is the start state of M_2?

What is the start state of M_2?

q_3

What is the set of accept states of M_1?

What is the set of accept states of M_1?

$$\{q_1\}$$

What is the set of accept states of M_2?

What is the set of accept states of M_2?

$$\{q_1, q_3\}$$

What is the alphabet, Σ, M_2 operates over?

What is the alphabet, Σ, M_2 operates over?

$$\{a, b\}$$

Fill in the remainder of the transition function of M_1.

δ_1	a	b
?	?	?
q_2	q_3	q_3
q_3	q_2	q_1

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δ_1	a	b
q_1	q_2	q_1
q_2	q_3	q_3
q_3	q_2	q_1

Fill in the remainder of the transition function of M_2.

δ_2	a	b
?	?	?
q_2	q_4	q_3
q_3	q_4	q_3
q_4	q_2	q_1

Fill in the remainder of the transition function of M_2.

δ_2	a	b
q_1	q_1	q_2
q_2	q_4	q_3
q_3	q_4	q_3
q_4	q_2	q_1

Which of the machines accept the string *aaab*?

Which of the machines accept the string *aaab*?

M_2

Which of the machines accept ϵ (the empty string)?

Which of the machines accept ϵ (the empty string)?

Both M_1 and M_2

Which of the machines accept the string *bbaa*?

Which of the machines accept the string *bbaa*?

Neither M_1 nor M_2

True or False: $ab \in L(M_1)$

True or False: $ab \in L(M_1)$

False

True or False: $ab \in L(M_2)$

True or False: $ab \in L(M_2)$

True

Is it possible to construct a DFA that accepts no strings?

Is it possible to construct a DFA that accepts no strings?

Yes

Is it impossible to construct a DFA that accepts every string over a given alphabet?

Is it impossible to construct a DFA that accepts every string over a given alphabet?

No

What language does M_A recognize?

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$\{w \mid w \text{ has an odd number of } b\text{s } \}$

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What language does M_B recognize?

What language does M_A recognize?
$\{w \mid w \text{ has an odd number of } b\text{s } \}$

What language does M_B recognize?
$\{w \mid w \text{ contains at least three } a\text{s } \}$

$$M_A = (\{q_{odd}, q_{even}\}, \{a, b\}, \delta_A, q_{even}, \{q_{odd}\})$$

with δ_A as follows

δ_A	a	b
q_{odd}	q_{odd}	q_{even}
q_{even}	q_{even}	q_{odd}

$$M_B = (\{q_{20}, q_{21}, q_{22}, q_{23}\}, \Sigma, \delta_2, q_{20}, \{q_{23}\})$$

with δ_B as follows

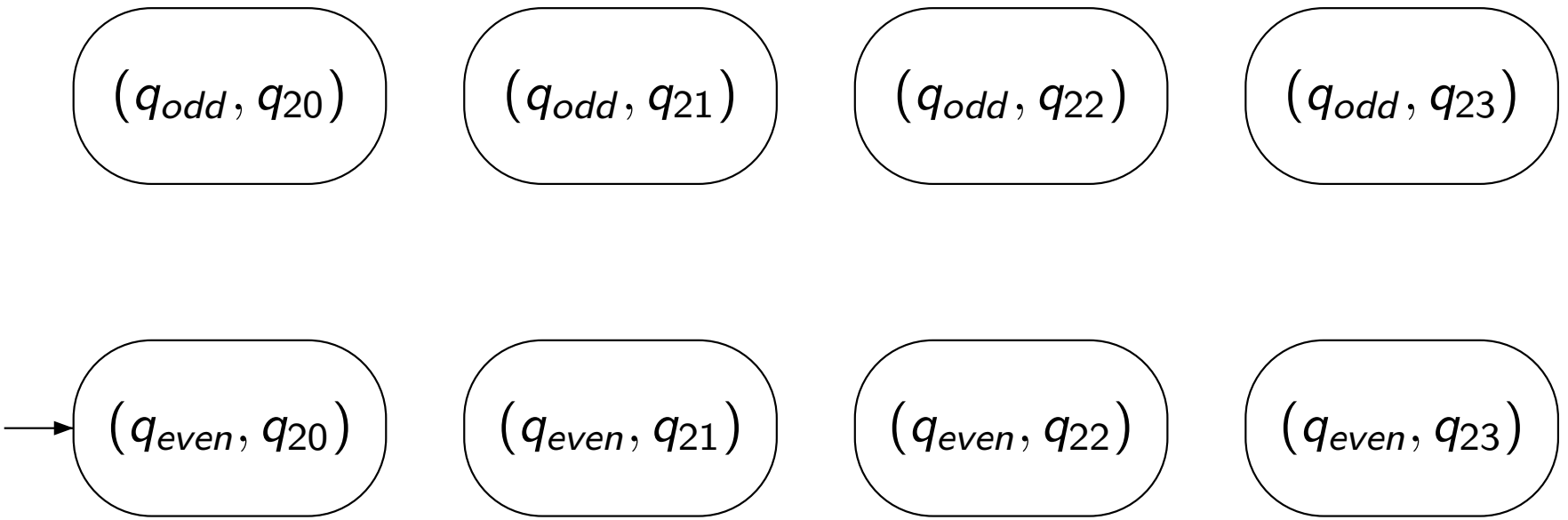
δ_B	a	b
q_{20}	q_{21}	q_{20}
q_{21}	q_{22}	q_{21}
q_{22}	q_{23}	q_{22}
q_{23}	q_{23}	q_{23}

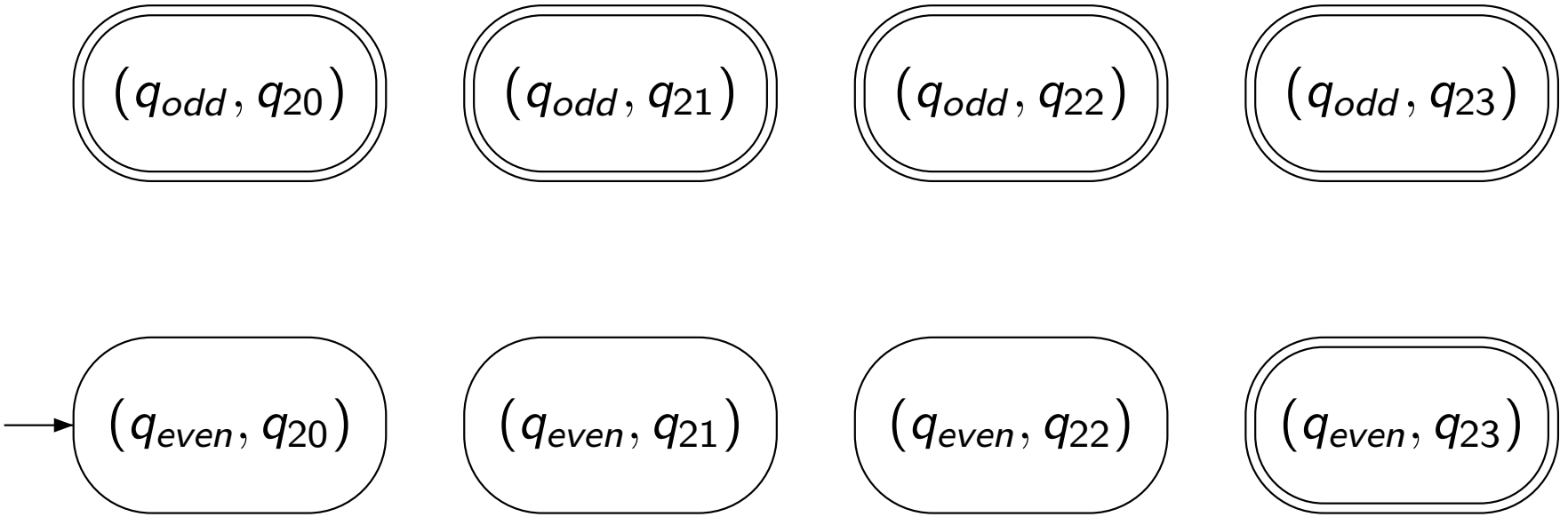
Pick at least two of the following languages and draw out DFAs that recognize the given language. For at least one of these write down the transition function.

1. The string contains exactly 2 *a*s
2. The string starts with an *a*
3. The string contains at most one *b*
4. The string is of even length
6. Each *a* is followed by at least one *b*
7. The string ends with a *b*

(q_{odd}, q_{20}) (q_{odd}, q_{21}) (q_{odd}, q_{22}) (q_{odd}, q_{23})

(q_{even}, q_{20}) (q_{even}, q_{21}) (q_{even}, q_{22}) (q_{even}, q_{23})


(q_{odd}, q_{20})
(q_{odd}, q_{21})
(q_{odd}, q_{22})
(q_{odd}, q_{23})
(q_{even}, q_{20})
(q_{even}, q_{21})
(q_{even}, q_{22})
(q_{even}, q_{23})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(q_{odd}, q_{23})
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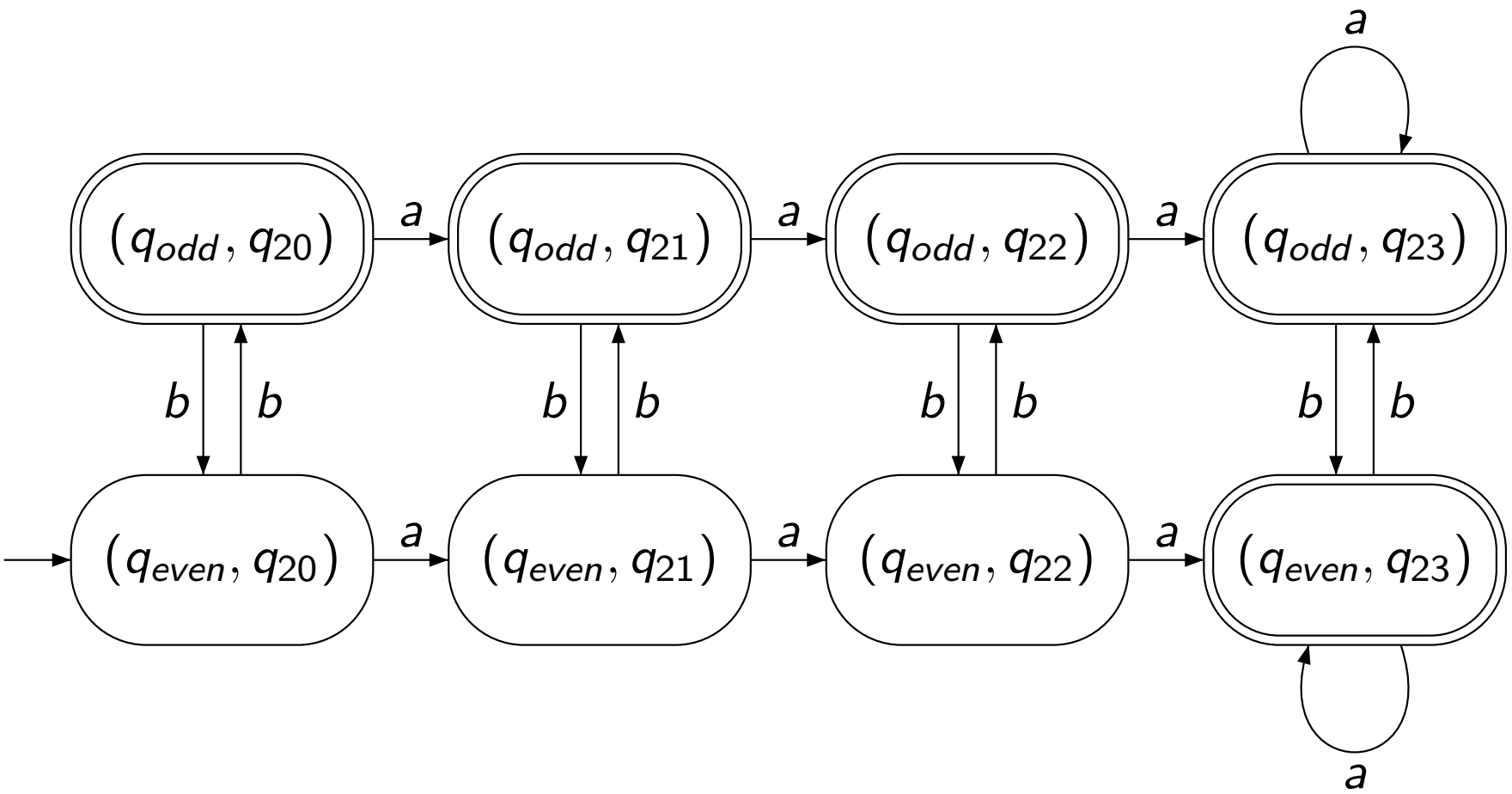
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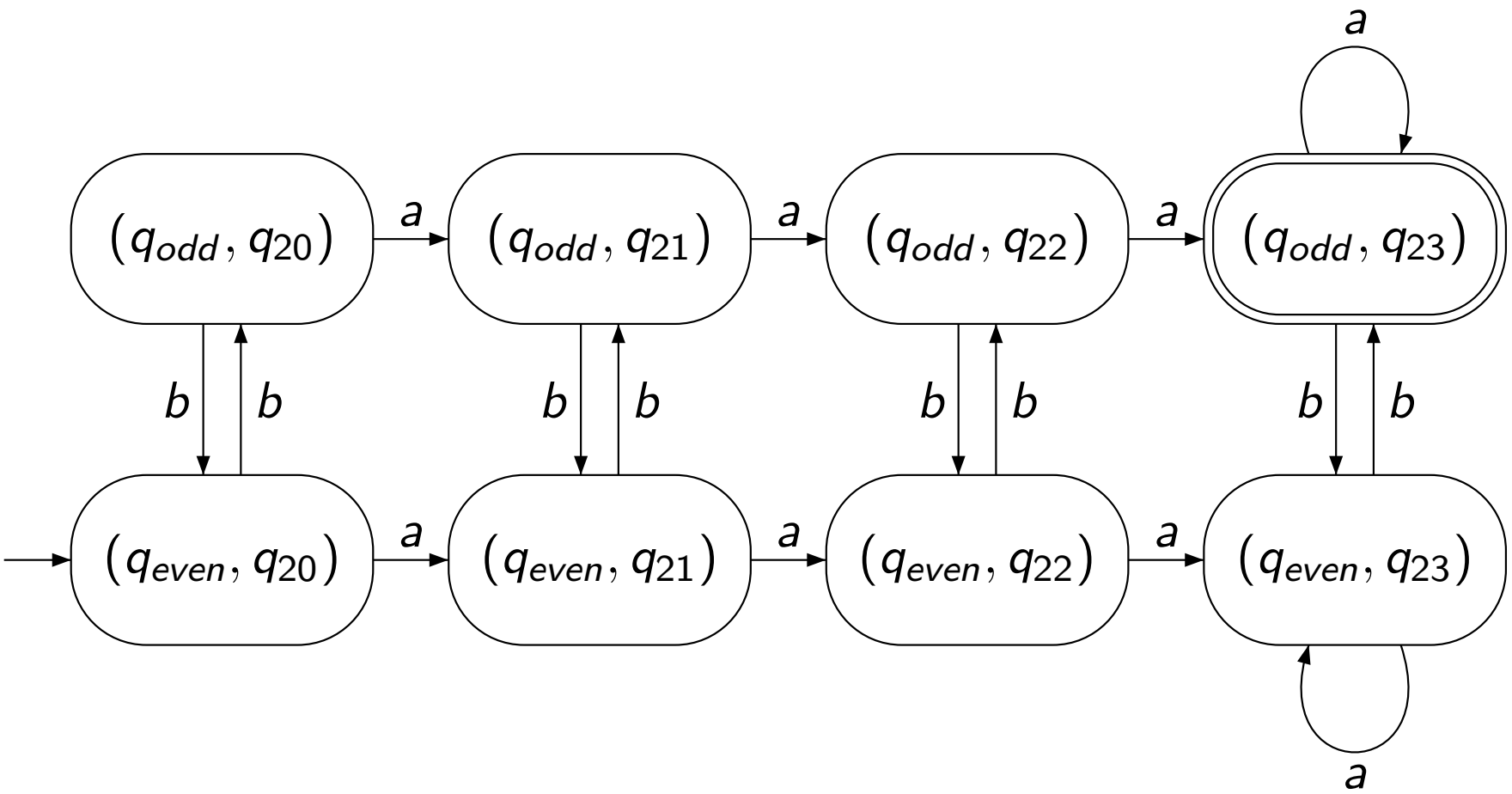
(q_{even}, q_{21})
(q_{even}, q_{22})
(q_{even}, q_{23})
a
b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(q_{even}, q_{23})
a
b

Your Turn

Pick two of the DFAs you just constructed and construct new DFAs that recognize the union and intersection of the languages recognized by these two DFAs.

$\{w \mid w \text{ begins with a 1 and ends with a 0}\}$

$\{w \mid w \text{ contains the substring 0101 }\}$

$\{w \mid w \text{ contains a 0 in the third position }\}$

$\{w \mid w$ starts with 0 and has even length or starts with a 1 and has odd length $\}$

$\{w \mid w$ has a length of at most 5 $\}$

$\{w \mid w$ is any string except 11 or 111 $\}$

$\{\}$

$\{\epsilon, 0\}$

The set of all strings execpt ϵ