# ECS120 Fall 2007 Discussion Notes

October 24, 2007

# Homework 3

Grading and Solution Notes

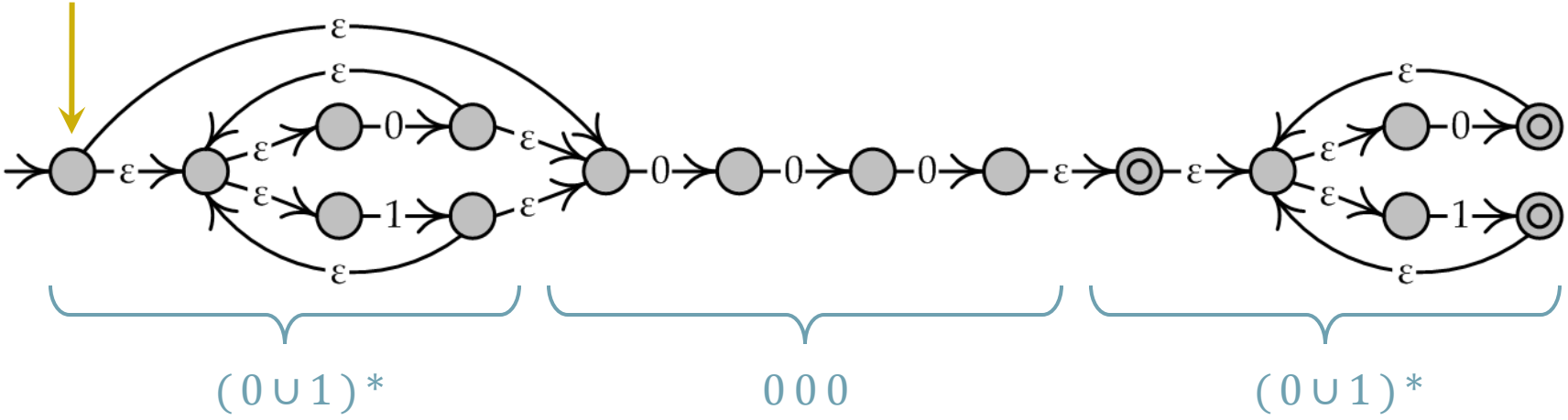
# Graded Problems

- Problem 1 (10 possible)
  - 4 points for part (a)
  - 4 points for part (b)
  - 2 points for part (c)
- Problem 3 (15 possible)
  - 5 points for part (a) and (b)
  - 5 points for part (c)
  - 5 points for part (d)
- Problem 4 (10 possible)

# Problem 1 (a)

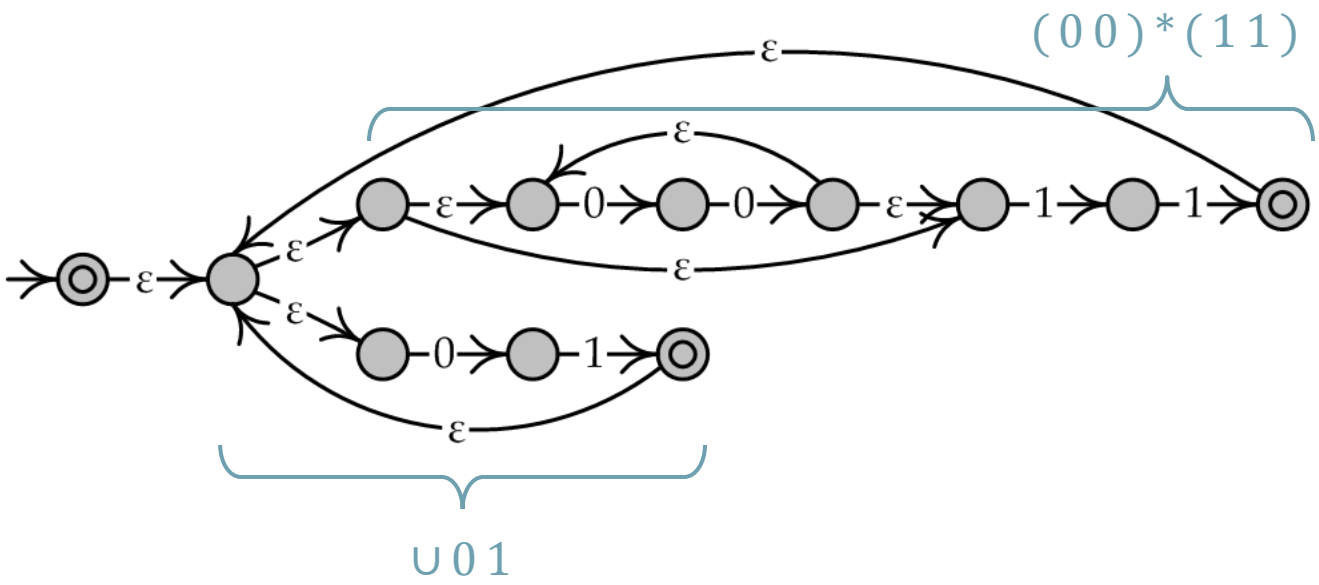
- Unreduced NFA for $(0 \cup 1)^*000(0 \cup 1)^*$

concatenation removed
the final state here



# Problem 1 (b)

- Unreduced NFA for $(((00)^*(11))\cup 01)^*$

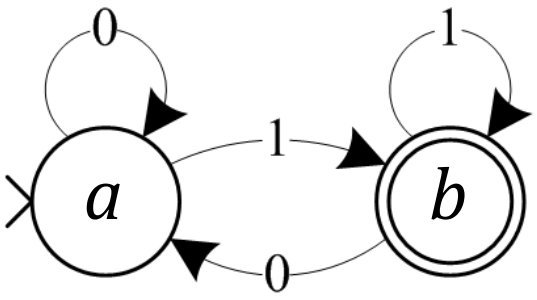


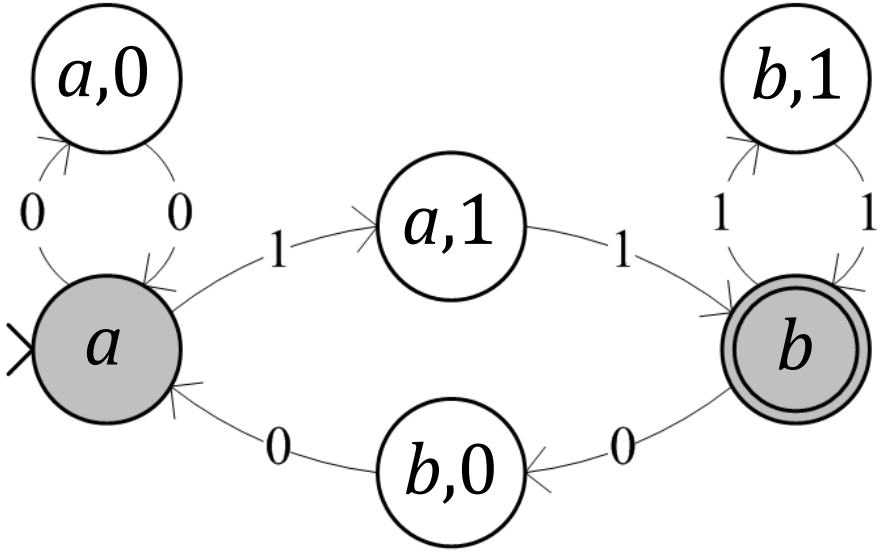
# Problem 3 (c)

- Show that the language ECHO($A$) is regular.
  - Assume $A$ is expressed as a DFA $M$.
    - Otherwise, convert the NFA or regex to a DFA.
  - Create a new DFA or NFA $M' = \{ Q', \Sigma, \delta', q_0, F \}$
    - $Q'$ and $\delta'$ defined as…
    - Give the actual components of the new DFA!
    - "Show" still means you have to be formal!

# Problem 3 (c)

- $Q' = Q \cup Q \times \Sigma$



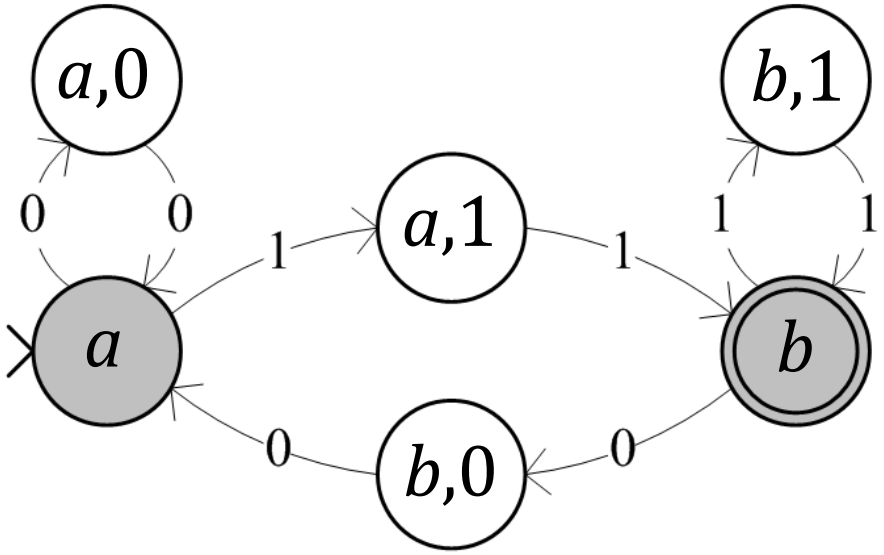

$Q = \{ a, b \}$

$Q = \{ a, b, \{a,0\}, \{a,1\}, \{b,0\}, \{b,1\} \}$

# Problem 3 (c)

- $\delta'(q, \sigma) = \{q, \sigma\}$ for $q \in Q$

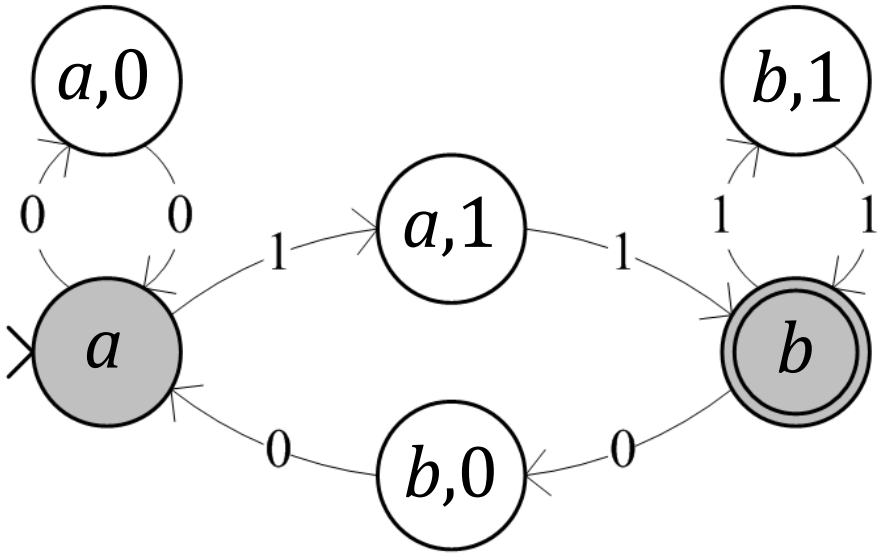
| | 0 | 1 |
|---|---|---|
| $a$ | $\{ a, 0 \}$ | $\{ a, 1 \}$ |
| $b$ | $\{ b, 0 \}$ | $\{ b, 1 \}$ |



# Problem 3 (c)

- $\delta'(\{q, \sigma\}, \gamma) = \delta(q, \sigma)$ if $\sigma = \gamma$

| | 0 | 1 |
|---|---|---|
| $\{a, 0\}$ | $a$ | $\emptyset$ |
| $\{a, 1\}$ | $\emptyset$ | $b$ |
| $\{b, 0\}$ | $a$ | $\emptyset$ |
| $\{b, 1\}$ | $\emptyset$ | $b$ |

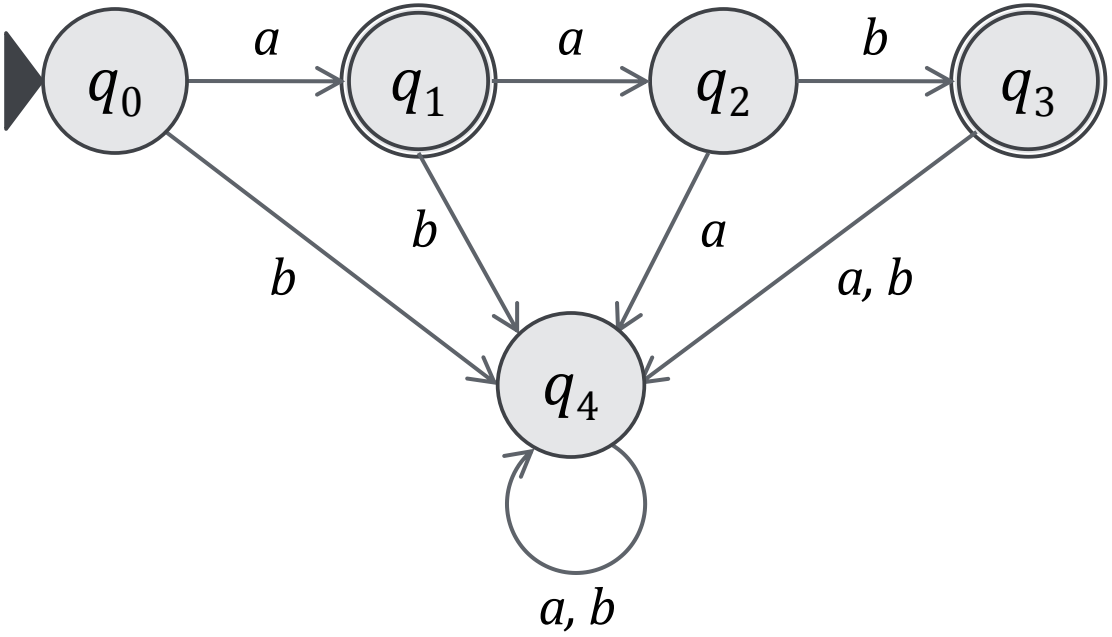


# Problem 3 (d)

- Show the language NoExtend($A$) is regular.
  - Assume $A$ is expressed as a DFA $M$.
    - Otherwise, convert the NFA or regex to a DFA.
  - Create a new DFA $M' = \{ Q, \Sigma, \delta, q_0, F' \}$
    - $F' = \{ q \in F \mid$ there is no nonempty path from $q$ to another final state $f \in F \}$

# Problem 3 (d)

- Example:
  - $A = \{ a, aab \}$
  - NoExtend(A) = $\{ aab \}$



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- Example:
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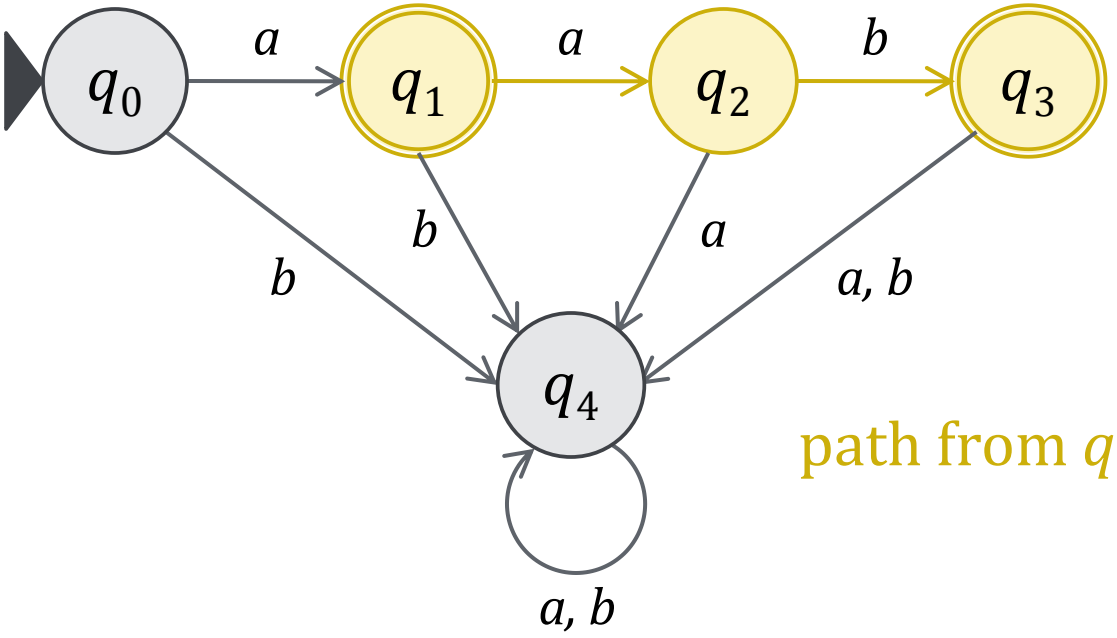
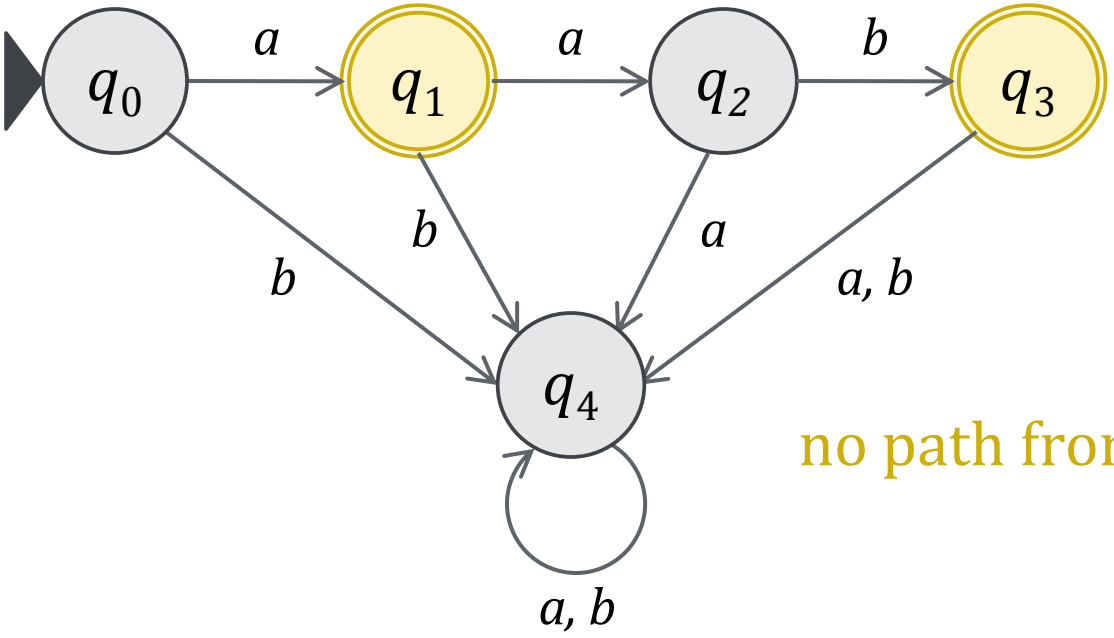
  - NoExtend(A) = $\{ aab \}$



# Problem 3 (d)

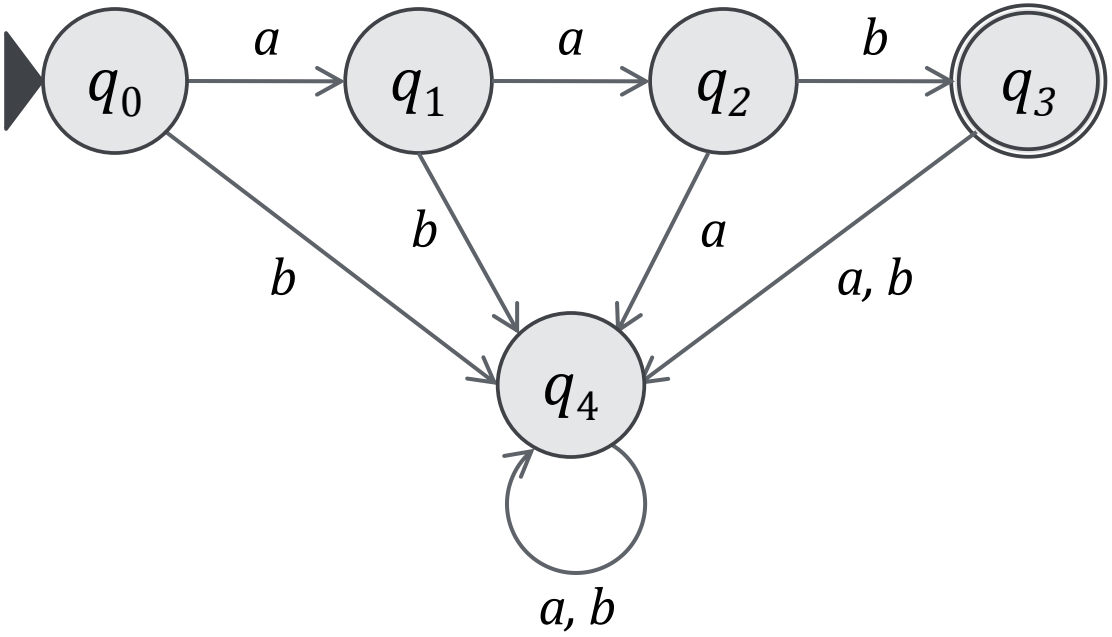
- Example:
  - $A = \{ a, aab \}$
  - NoExtend(A) = $\{ aab \}$




no path from $q_3$ to $q_1$

# Problem 3 (d)

- Example:
  - $A = \{ a, aab \}$
  - NoExtend(A) = $\{ aab \}$



# Problem 3 (d)

- Show the language NoExtend($A$) is regular.
  - Also need to show that $L(M') = \text{NoExtend}(A)$.
    - Show $L(M') \subseteq \text{NoExtend}(A)$.
      - Argue that if $x \in L(M')$, then $x \in \text{NoExtend}(A)$.
    - Show $\text{NoExtend}(A) \subseteq L(M')$.
      - Argue that if $x \in \text{NoExtend}(A)$, then $x \in L(M')$.

# Problem 4

- Give a decision procedure for IsPrefix( $A$, $u$ ).
  - The input is $A$, $u$.
  - The input is not $w$.
    - There could be an infinite number of strings $w \in A$.