CSE 355: Intro to Theoretical Computer Science
Recitation #4 Solution

1. [5 pts] Write the formal description of each set described by the regular expression below. Assume alphabet $\Sigma = \{0, 1\}$.

Example: $(0 \cup 1)^*00(0 \cup 1)^*11(0 \cup 1)^*$

Answer: $L = \{xy \mid where\ x\ contains\ substring\ 00\ and\ y\ contains\ substring\ 11\}$

A) 1^*01^*

L = {ω | ω contains a single 0}

B) $(\Sigma\Sigma\Sigma)^*$

L = {ω| the length of ω is multiple of 3}

C) $(0\Sigma^*0) \cup (1\Sigma^*1) \cup 0 \cup 1$

L = {ω| ω starts and ends with the same symbol}

D) $0^* \cup 1^*$

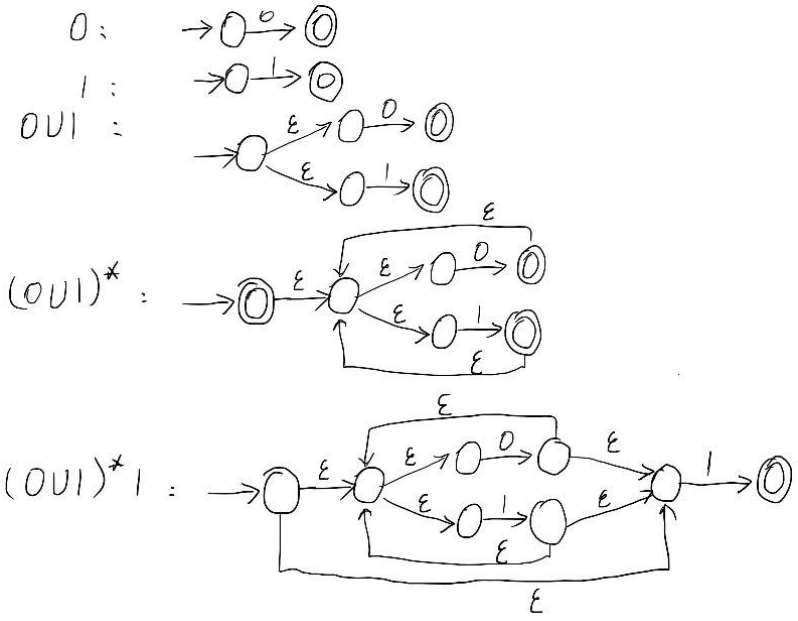
L = {ω| ω is either ε or contains all 0s or all 1s}

E) $(10)^+(\Sigma \cup \varepsilon)$

L = {ω| ω starts with a prefix 10, followed by any number of 10s and must end in either 10, 01 or 00}

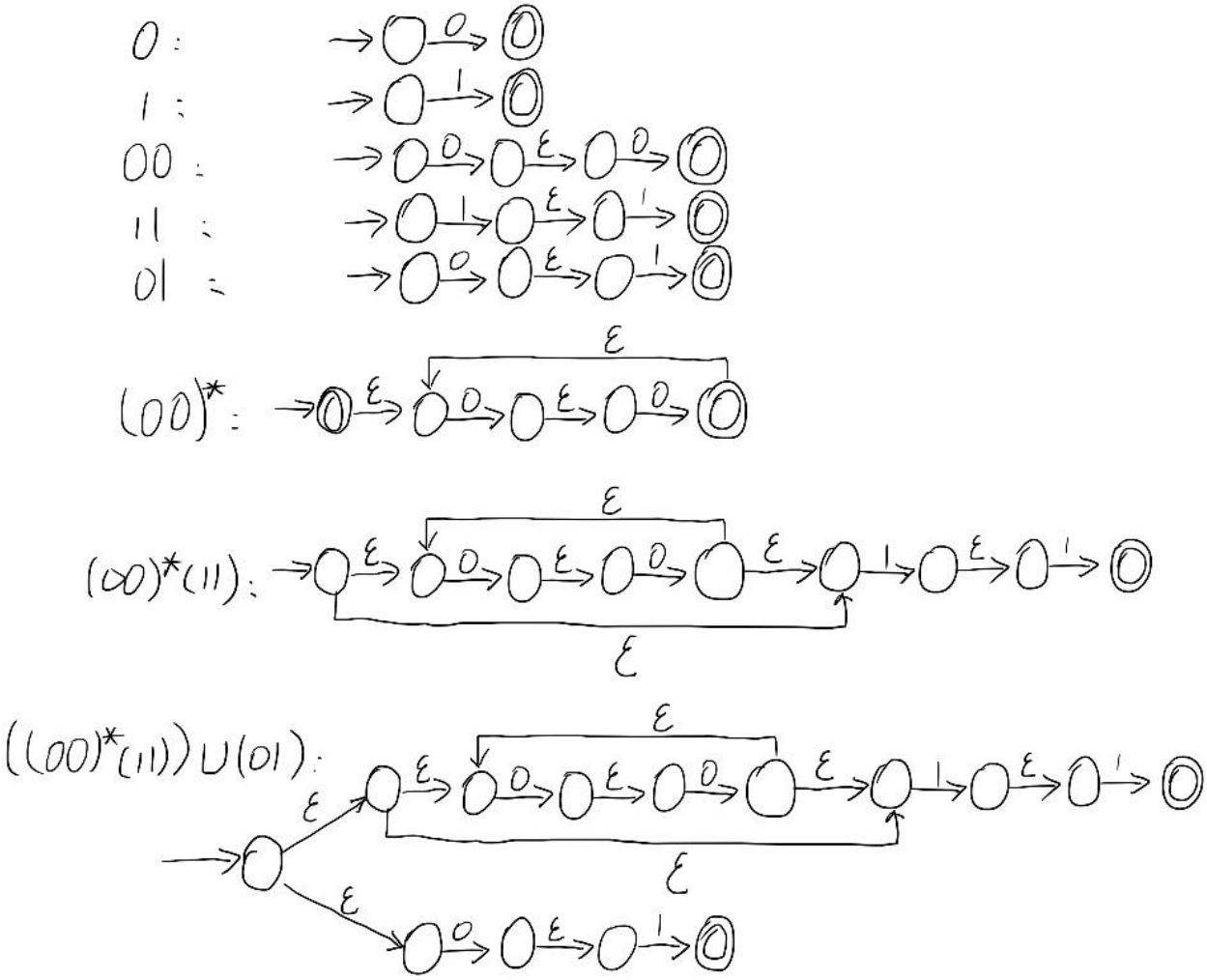
2. [5 pts] Let $\Sigma = \{0, 1\}$, use the procedure describe in class to convert the following RE into an NFA. Show step-by-step construction and no simplification.

$(0 \cup 1)^*1$

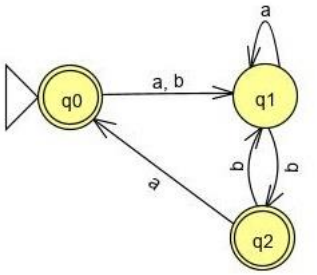


3. [5 pts] Use the procedure described in Lemma 1.55 (textbook pp.88) to convert the following RE into an NFA. Show step-by-step construction.

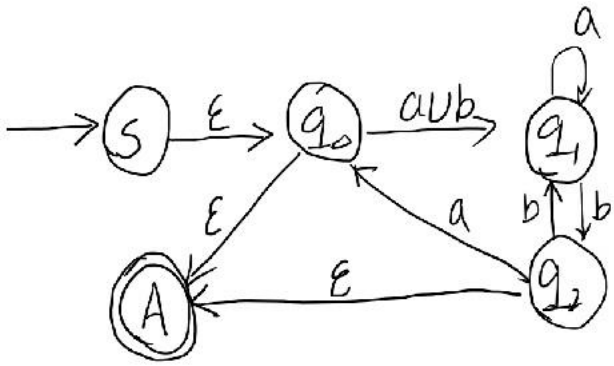
$$(((00)^*(11)) \cup 01)^*$$



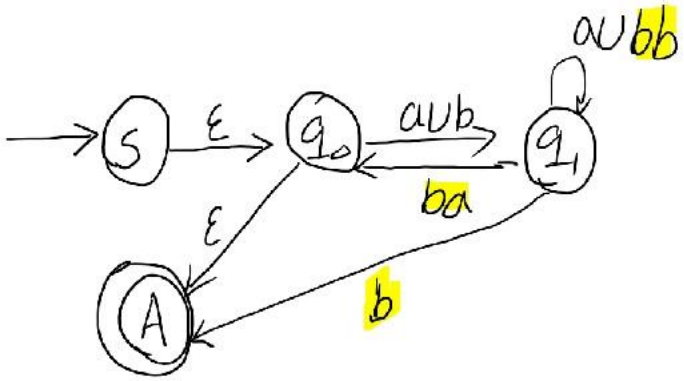
4. [5 pts] Use the procedure described in Lemma 1.60 (textbook pp.90) to convert the following DFA into a regular expression. Eliminate states in the order of q_2, q_0 and q_1. Assume alphabet $\Sigma = \{a, b\}$.



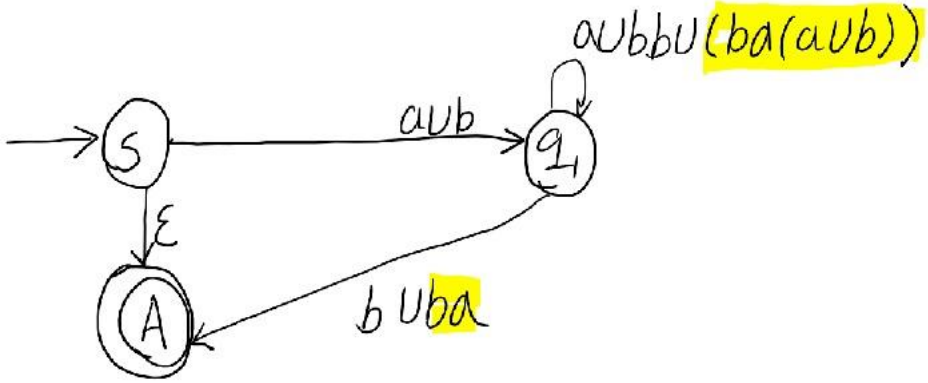
Step #1: Convert above 3 states DFA into a 5 states GNFA



Step #2: Eliminate state q_2



Step #4: Eliminate state q_0



Step #2: Eliminate state q_1