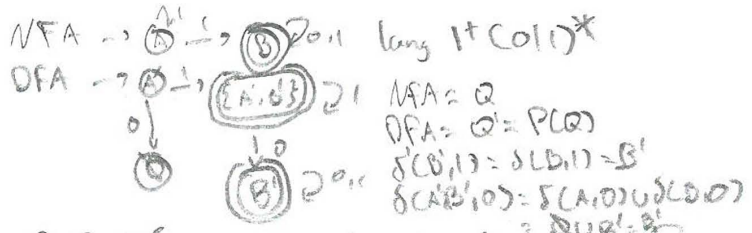
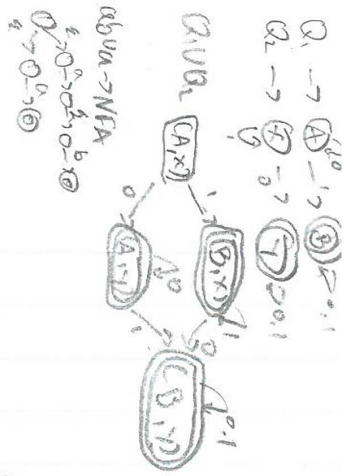




CS Theory cheat sheet Exam 1

Finite Automata $(Q, \Sigma, \delta, q_0, F)$ - FA

- Q - set of states
- Σ - Alphabet
- δ - Transition function $Q \times \Sigma \to Q$, NFA: $Q \times \Sigma_\varepsilon \to P(Q)$, $\Sigma_\varepsilon = \Sigma \cup \{\varepsilon\}$
- q_0 - Start state
- F - Accept state

Reg Lang - Lang Desc by FA - RL

$A \cup B = \{x \mid x \in A \text{ or } x \in B\}$

$A \cdot B = \{xy \mid x \text{ and } y\}$

If A_1 and A_2 Reg then $A_1 \cup A_2$ is Reg

Deterministic: given current state and input know next state

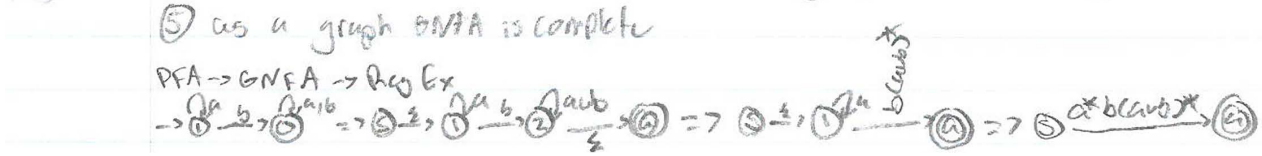
Lang is Reg iff Desc. by RegX

Gen NFA ① Arrows desc w/ string ② Start → any other state, no → to start

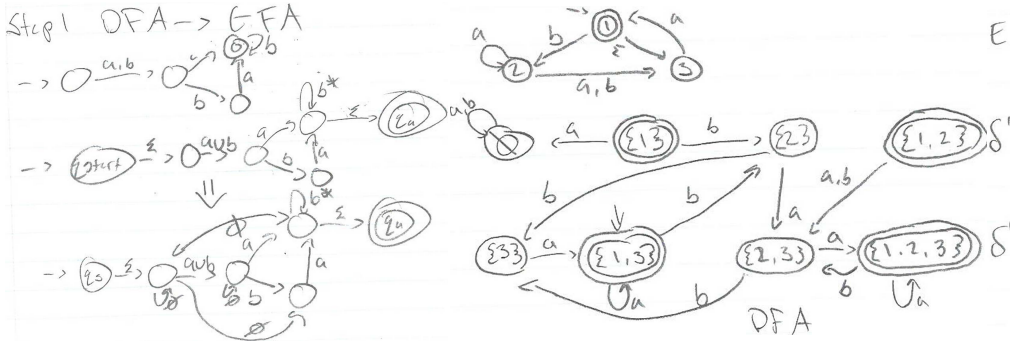
③ Accept State ← from all other States no outgoing → ④ qaccept ≠ qStart

⑤ as a graph GNFA is complete

PFA → GNFA → Reg Ex



Step 1 DFA → ε-FA



$E(\{1\}) = \{1,3\}$ (0 or more Σ-transitions)

$\delta'(\{3\}, a) = \{q \in Q \mid q \in E(\delta(3,a))\}$
$= \{q \in Q \mid q \in E(\{1\})\}$
$= \{q \in Q \mid q \in \{1,3\}\} = \{1,3\}$

$\delta'(\{2,3\}, a) = \{q \in Q \mid q \in E(\delta(2,a)) \,\&\, q \in E(\delta(3,a))\}$
$= \{q \in Q \mid q \in E(\{2,3\}) \,\&\, q \in E(\{1,3\})\}$
$= \{1,2,3\}$