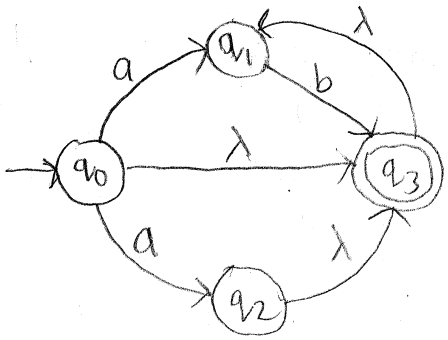


Exam 1

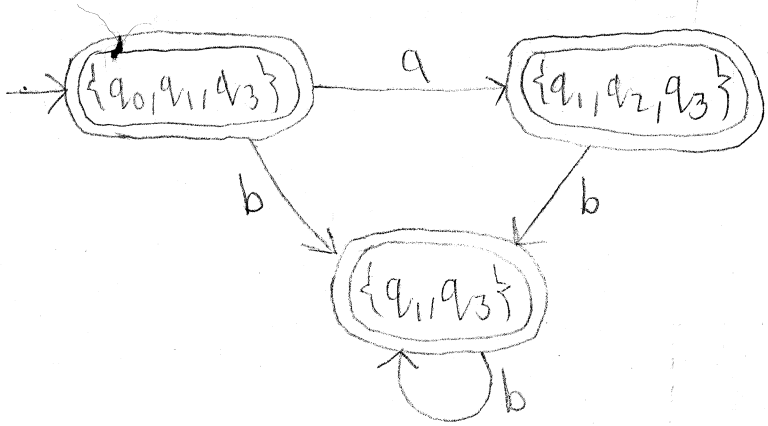
1. abbb
   bbb

   Give 2 strings of different lengths that are accepted.

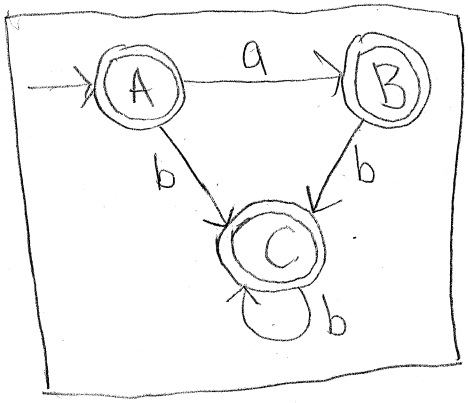
2. Convert to equivalent DFA

δ	a	b
$\{q_0, q_1, q_3\}$	$\{q_1, q_2, q_3\}$	$\{q_1, q_3\}$
$\{q_1, q_2, q_3\}$	—	$\{q_1, q_3\}$
$\{q_1, q_3\}$	—	$\{q_1, q_3\}$

initial states: q_0, q_3, q_1



A = $\{q_0, q_1, q_3\}$
B = $\{q_1, q_2, q_3\}$
C = $\{q_1, q_3\}$



3. From DFA, write equivalent regular grammar as (V, T, P, S)

$G = (\{A, B, C\}, \{a, b\}, A, P)$

P is defined by:

$A \to aB$
$A \to bC$
$A \to \lambda$
$B \to bC$
$B \to \lambda$
$C \to bC$
$C \to \lambda$

4. Convert to equivalent minimal DFA.

$P_0 = (\{A, B, C\})$

$\delta(A, a) = B$ $\quad \delta(B, a) = \emptyset$
$\delta(A, b) = C$ $\quad \delta(B, b) = C$

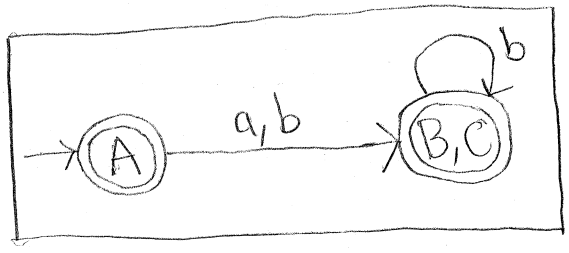
$\delta(A, a) = B$ $\quad \delta(C, a) = \emptyset$
$\delta(A, b) = C$ $\quad \delta(C, b) = C$

— is distinguishable

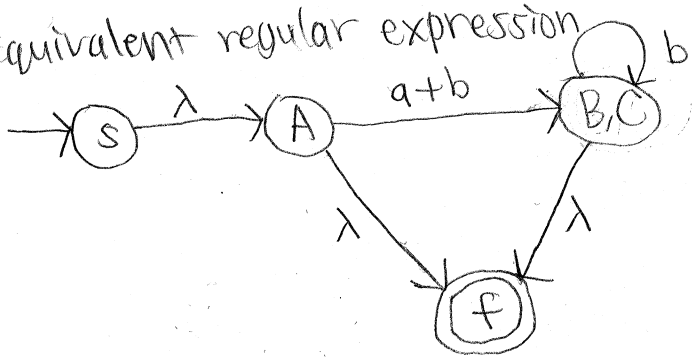
$\delta(B, a) = \emptyset$ $\quad \delta(C, a) = \emptyset$
$\delta(B, b) = C$ $\quad \delta(C, b) = C$

— aren't distinguishable

$P_1 = (\{B, C\}, \{A\})$

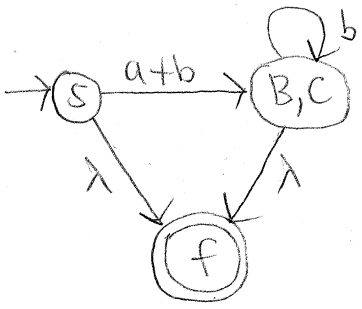


5. Equivalent regular expression



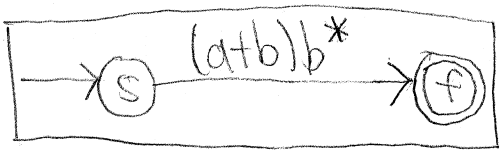
$new(s,(B,C)) = old(s,(B,C)) + old(s,A)\,old(A,A)^*\,old(A,(B,C))$

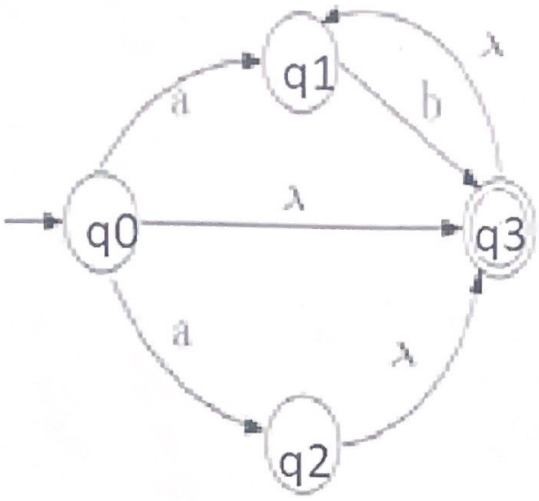
$= \emptyset + \lambda\emptyset^*(a+b) = a+b$



$new(s,f) = old(s,f) + old(s,(B,C))\,old((B,C),(B,C))^*\,old((B,C),f)$

$= \lambda + (a+b)b^*\lambda = (a+b)b^*$





SHOW ALL THE STEPS TO RECEIVE FULL CREDIT FOR EACH OF THE FOLLOWING:

1. (5 points) Give two strings of different lengths that are accepted by the above NFA.
2. (5 points) Describe the extended transition function on the above two strings using transitions one symbol at a time.
3. (30 points) Convert the NFA to an equivalent DFA (Don't need to include a trap/dead state) Describe the state diagram and label the new states using new labels A,B,C,D,E,…. (as needed)
4. (20 points) From above DFA, write an equivalent regular grammar as (V,T,P,S)
5. (20 points) Convert the above to an equivalent minimal DFA. Show the partitioning steps. Give the state diagram of the minimal DFA.
6. (20 points) From above minimal DFA, describe an equivalent regular expression. Create a new start state (s) and a new final state (f). Show step by step eliminating one state at a time in deriving the regular expression.