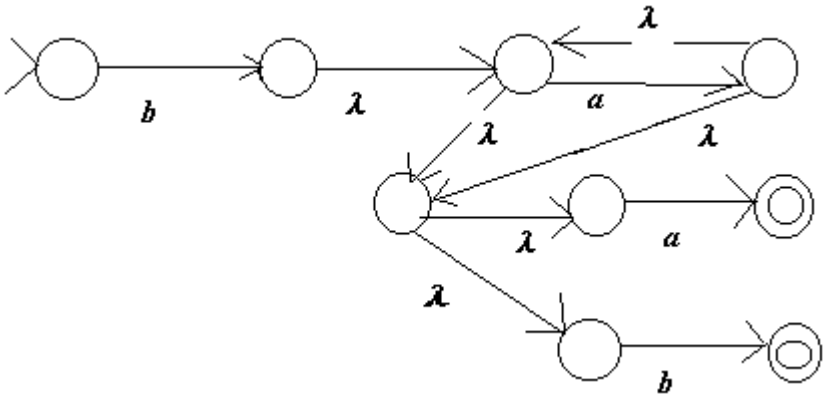
CS3133
HW #4 SOLUTIONS

1.



2. *a*) An equivalent DFA is

$$\left(\left\{\{q_0,q_2\},\{q_0,q_1,q_2\},\{q_2\},\varnothing\right\},\{a,b\},\delta,\{q_0,q_2\},\left\{\{q_0,q_2\},\{q_0,q_1,q_2\},\{q_2\}\right\}\right)$$

where

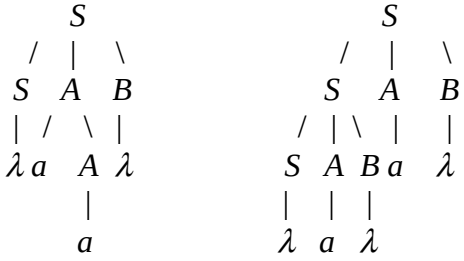
δ	a	b
$\{q_0,q_2\}$	$\{q_0,q_1,q_2\}$	$\varnothing$
$\{q_0,q_1,q_2\}$	$\{q_0,q_1,q_2\}$	$\{q_2\}$
$\{q_2\}$	$\varnothing$	$\varnothing$
$\varnothing$	$\varnothing$	$\varnothing$

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

3. *a*) $S \Rightarrow SAB \Rightarrow SABSAB \Rightarrow ABSAB \Rightarrow aBSAB \Rightarrow abBSAB \Rightarrow abbSAB \Rightarrow abbAB$
$\Rightarrow abbaAB \Rightarrow abbaaB \Rightarrow abbaabB \Rightarrow abbaab$

b) $S \Rightarrow SAB \Rightarrow AB \Rightarrow aAB \Rightarrow aaB \Rightarrow aa$ and
$S \Rightarrow SAB \Rightarrow SABAB \Rightarrow ABAB \Rightarrow aBAB \Rightarrow aAB \Rightarrow aaB \Rightarrow aa$

c)



d) $\left(a^+b^*\right)^* = \left(aa^*b^*\right)^*$

4. The CONJECTURE is false. Language $L = a^*$ is regular since it is generated by the regular grammer $S \to \lambda | aS$. But *L* is also generated by the grammer $S \to SS|a|\lambda$ which is not regular.