

# Sample Exam Solutions

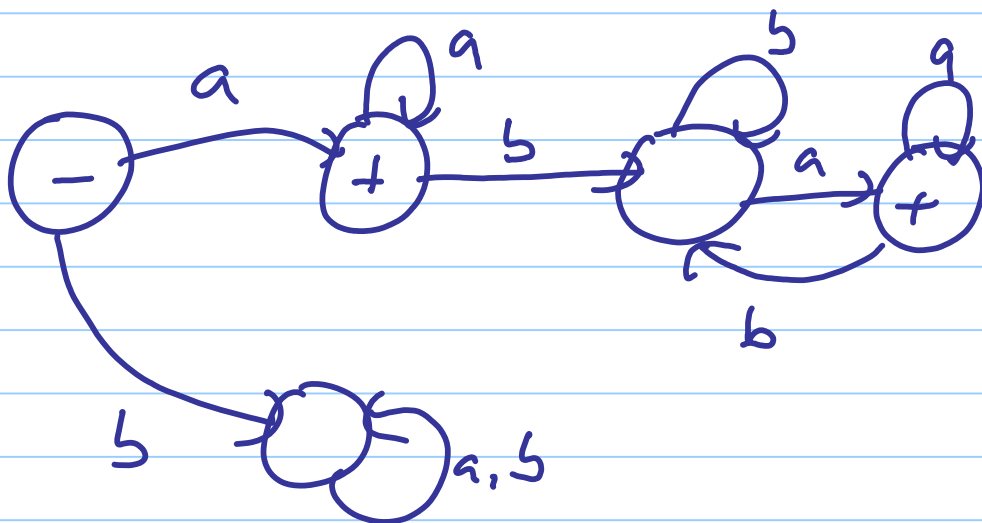
Note Title

15/11/2012

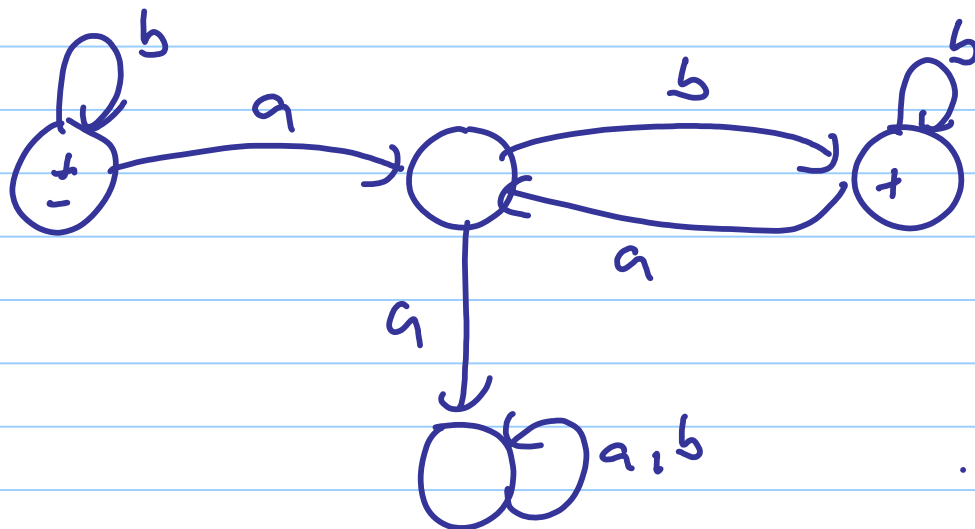
- 1) R1: The word  $abb \in L$   
 R2: If  $w \in L$  then  $awbb \in L$   
 R3: No other words belong to  $L$

- 2) a) i)  $a(a+ab)^*a + a$   
 ii)  $b^*(abb^*)^*$

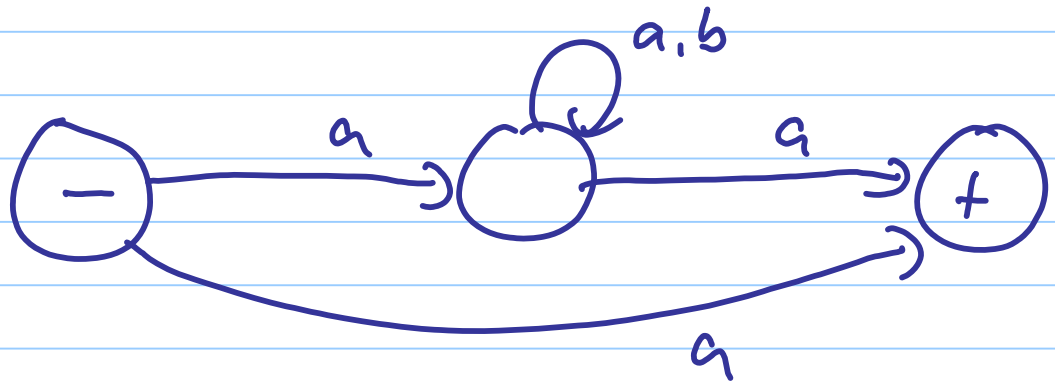
b) i)



b) ii)



2) c)



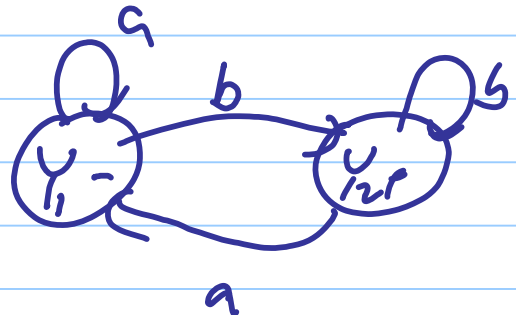
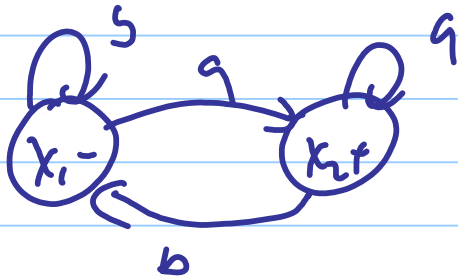
d)  $S \rightarrow bS \mid aX \mid \epsilon$

$X \rightarrow aZ \mid bY$

$Y \rightarrow aX \mid bY \mid \epsilon$

$Z \rightarrow aZ \mid bZ$

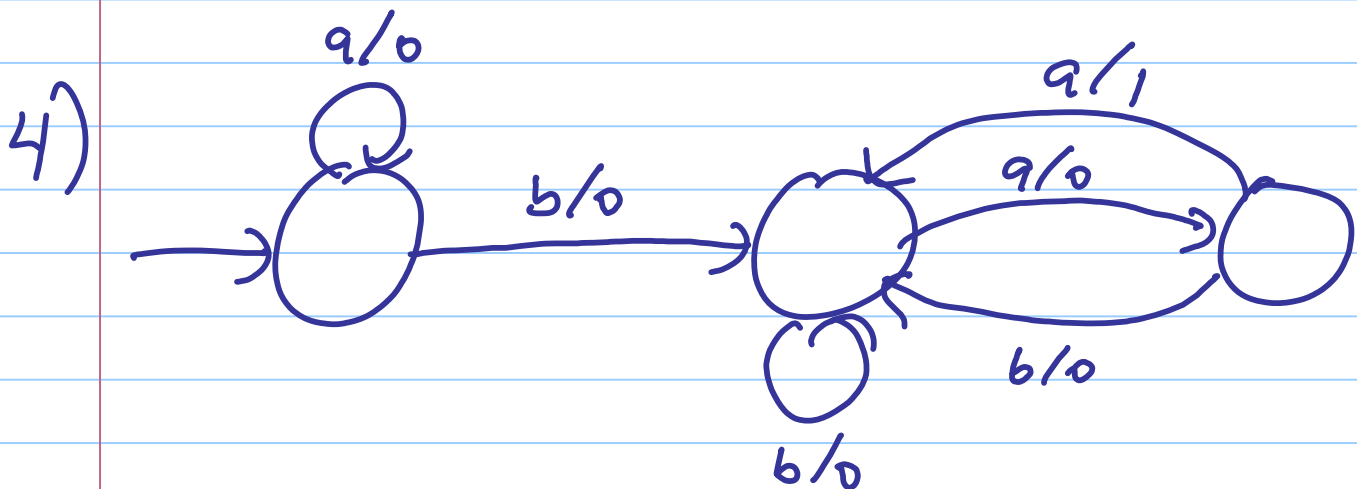
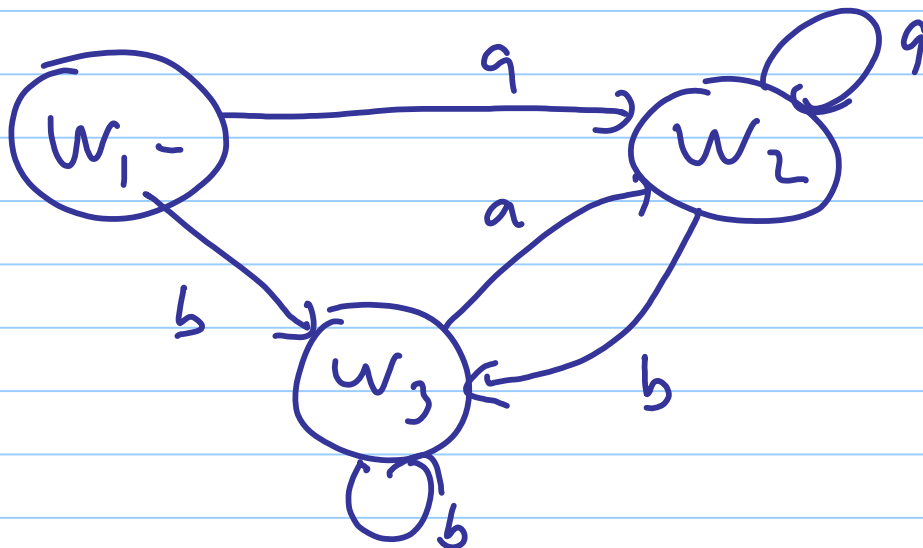
3)



3)

New State	Input a	Input b
$X_1/Y_1(w_1) -$	$X_2/Y_1(w_2)$	$X_1/Y_2(w_3)$
$X_2/Y_1(w_2) +$	$X_2/Y_1(w_2)$	$X_1/Y_2(w_3)$
$X_1/Y_2(w_3) +$	$X_2/Y_1(w_2)$	$X_1/Y_2(w_3)$

No final state!



5) CFG for  $a$   
 $S \rightarrow a$

CFG for  $ab$   
 $S \rightarrow ab$

CFG for  $aa$   
 $S \rightarrow aa$

CFG for  $a+ab$   
 $S \rightarrow S_1 | S_2$   
 $S_1 \rightarrow a$   
 $S_2 \rightarrow ab$

CFG for  $(aa)^n$   
 $S \rightarrow S_3 S | \Lambda$   
 $S_3 \rightarrow aa$

CFG for  $(a+ab)(aa)^n$   
 $S \rightarrow S_4 S_5$   
 $S_4 \rightarrow S_1 | S_2$   
 $S_1 \rightarrow a$   
 $S_2 \rightarrow b$

$S_5 \rightarrow S_3 S_5 | \Lambda$   
 $S_3 \rightarrow aa$

6)  $S \rightarrow aX | bX$

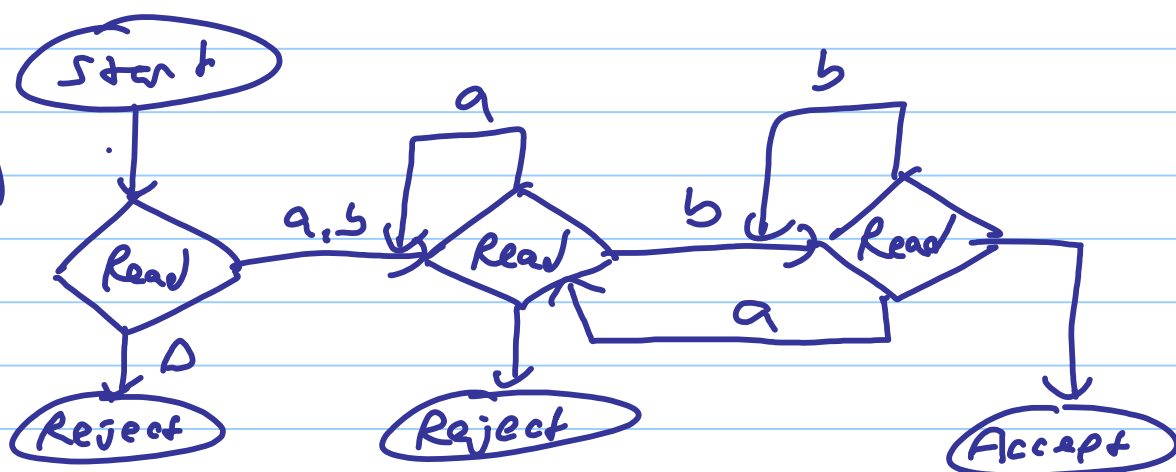
$X \rightarrow aX | bY$

$Y \rightarrow aX | bY | \Lambda$

CFG

6)

PDA



7) Replace  $D \rightarrow a, A \rightarrow b$  :

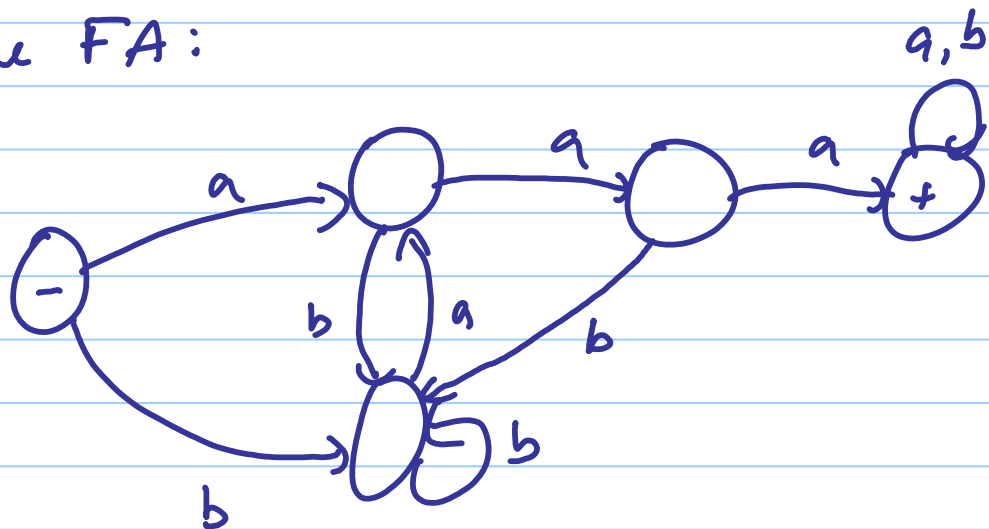
$S \rightarrow bB$   
 $A \rightarrow BC$   
 $C \rightarrow ab$   
 $B \rightarrow Ca$

Replace  $C \rightarrow ab$  :  $S \rightarrow bB, A \rightarrow Ba, B \rightarrow aBa$

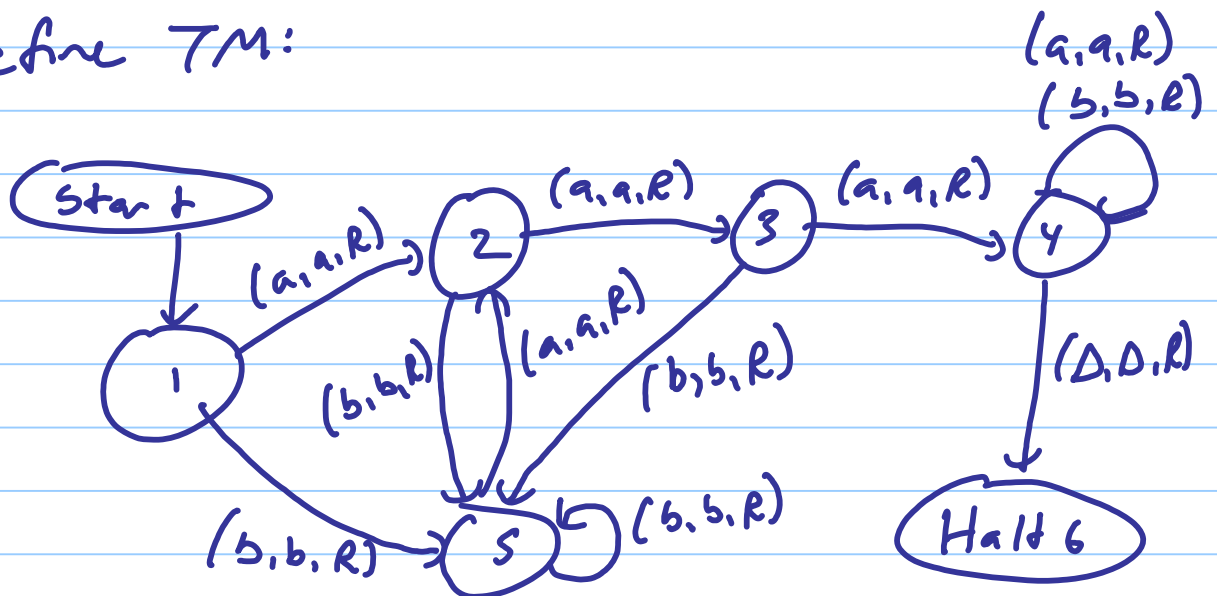
Replace  $B \rightarrow aBa$  :  $S \rightarrow baba$

Not empty since  $S$  derives  $baba$

g) Define FA:



Define TM:



9)

