Elif Nazlı Bülbül / 21253080

3.1.1.

a) aa, baa, aba, aab, aaa

b) $S \Rightarrow AA \Rightarrow bAA \Rightarrow bAAb \Rightarrow bAbbAb \Rightarrow babbAb \Rightarrow babbab$

$S \Rightarrow AA \Rightarrow bAA \Rightarrow bAAb \Rightarrow bAbAb \Rightarrow bAbbAb \Rightarrow babbab$

$S \Rightarrow AA \Rightarrow bAA \Rightarrow bAbA \Rightarrow babbA \Rightarrow babbAb \Rightarrow babbaba$

$S \Rightarrow AA \Rightarrow AAb \Rightarrow bAAb \Rightarrow baAb \Rightarrow babAb \Rightarrow babbAb \Rightarrow babbab$

c) $S \Rightarrow AA$

$\Rightarrow_m b^m AA \quad \Rightarrow b^m ab^n Ab^p$

$\Rightarrow_n b^m Ab^n A \quad \Rightarrow b^m ab^n ab^p$

$\Rightarrow_p b^m Ab^n Ab^p$

3.1.2. $S \Rightarrow bAb$
$\Rightarrow bSSb$
$\Rightarrow baAaSb$
$\Rightarrow baSSaSb$
$\Rightarrow baSaSb$
$\Rightarrow baaSb$
$\Rightarrow baabbAbb$
$\Rightarrow baabSSbb$
$\Rightarrow baabSbb$
$\Rightarrow baabbbb$

3.1.3. a) $G=(V,\Sigma,R,S)$, $V=\{a,b,S\}$
$\Sigma=\{a,b\}$
$R=\{S \to aSa, S \to bSb, S \to c\}$

b) $G=(V,\Sigma,R,S)$, $V=\{a,b,S\}$
$\Sigma=\{a,b\}$
$R=\{S \to aSa, S \to bSb, S \to e\}$

c) $G=(V,\Sigma,R,S)$
$V=\{a,b,S\}$
$\Sigma=\{a,b\}$
$R=\{S \to aSa, S \to bSb, S \to c\}$

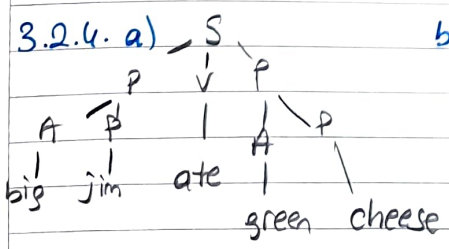
3.1.8. $G=(V,\Sigma,R,S)$

$V=\{:=, <, lbl\, i, j, if, then, while, do, begin, end, +, *, (,), id, T, I, E, S, M\}$

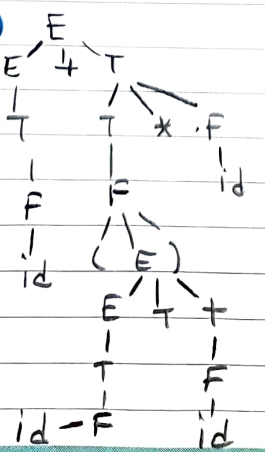
$\Sigma=\{:=, <, lbl, j, if, then, while, do, begin, end, +, *, (,), id\}$

$R=\{S \to id := E,\ S \to if\ E<E\ then\ S,\ S\ while\ E<E\ do\ S,\ S \to goto\ lbl,$
$S \to begin\ M\ end,\ S \to lbl\ S,\ M \to S;M,\ E \to E+T,\ E \to T,\ T \to T*F,\ T \to F,\ F \to (E),$
$F \to id\}$

3.2.4. a)



b)



c)