

Sylvain, Raphaël
(111 124 564)

Compilation et interprétation
IFT-3101

Travail pratique 2

Travail présenté à
Danny Dubé

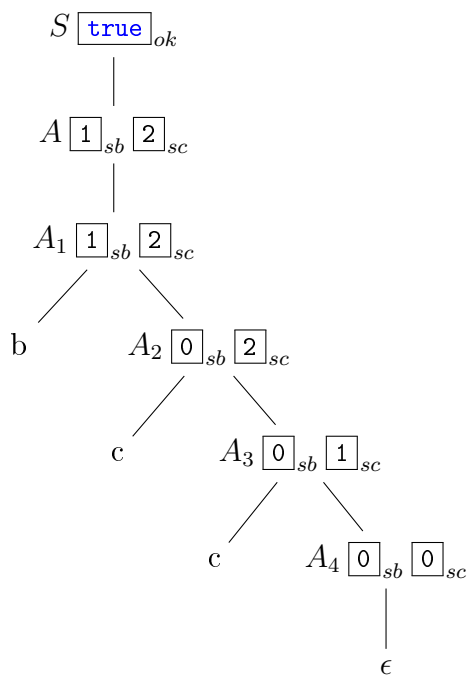
Département d'informatique et de génie logiciel
Université Laval
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Question 1

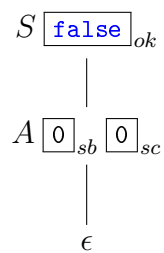
(a)

| Productions | Règles Sémantiques |
|--------------------------|----------------------------------------------|
| $S \rightarrow A$ | $S.ok := (A.sb \geq 1) \wedge (A.sc \geq 2)$ |
| $A \rightarrow a A_1$ | $A.sb := A_1.sb$ $A.sc := A_1.sc$ |
| $A \rightarrow b A_1$ | $A.sb := A_1.sb + 1$ $A.sc := A_1.sc$ |
| $A \rightarrow c A_1$ | $A.sb := A_1.sb$ $A.sc := A_1.sc + 1$ |
| $A \rightarrow \epsilon$ | $A.sb := 0$ $A.sc := 0$ |

Vérification positive avec le mot $bcc \in L_1$



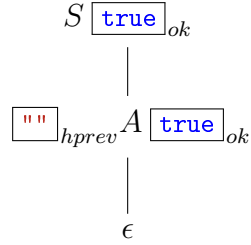
Vérification négative avec le mot $\epsilon \notin L_1$



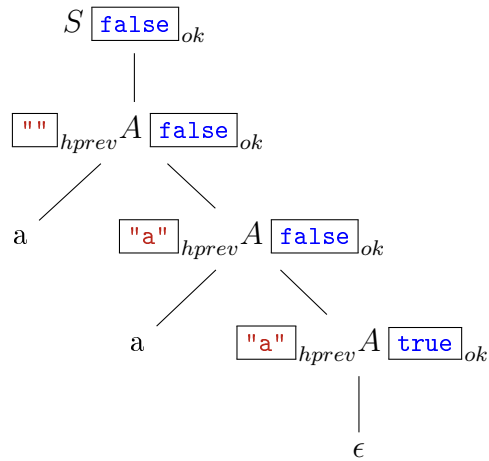
(b)

| Productions | Règles Sémantiques |
|--------------------------|----------------------------------------------------------------|
| $S \rightarrow A$ | $A.hprev := ""$ $S.ok := A.ok$ |
| $A \rightarrow a A_1$ | $A_1.hprev := "a"$ $A.ok := A_1.ok \wedge A.hprev \neq "a"$ |
| $A \rightarrow b A_1$ | $A_1.hprev := "b"$ $A.ok := A_1.ok \wedge A.hprev \neq "b"$ |
| $A \rightarrow c A_1$ | $A_1.hprev := "c"$ $A.ok := A_1.ok \wedge A.hprev \neq "c"$ |
| $A \rightarrow \epsilon$ | $A.ok := \text{true}$ |

Vérification positive avec le mot $\epsilon \in L_2$



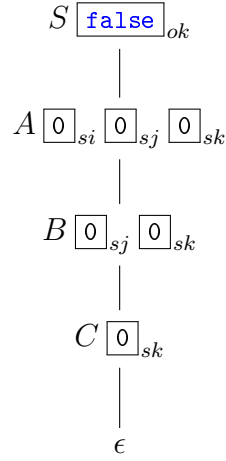
Vérification positive avec le mot $aa \notin L_2$



(c)

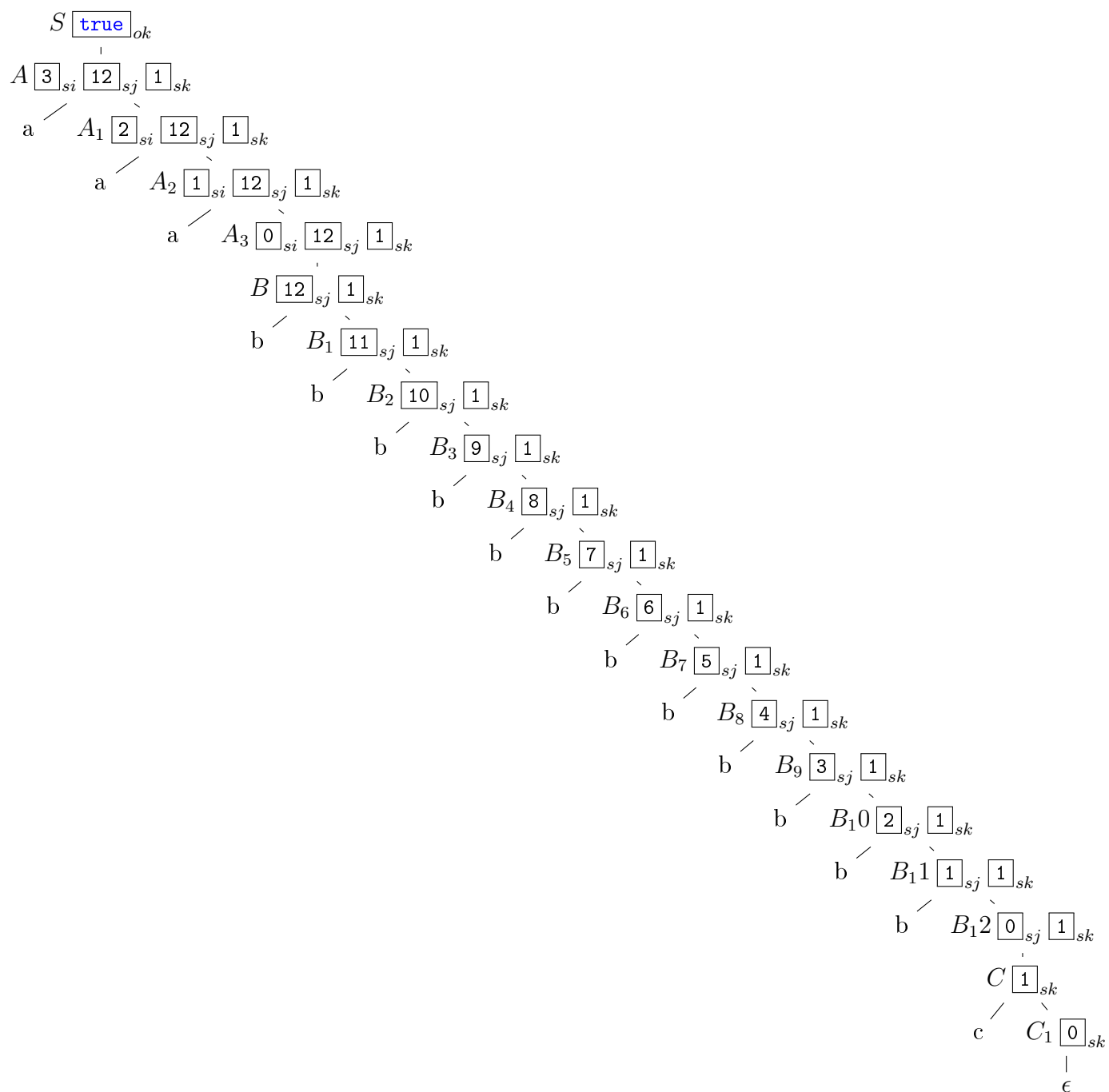
| Productions | Règles Sémantiques |
|--------------------------|--------------------------------------------------------------|
| $S \rightarrow A$ | $S.ok := (247 + 12 * A.si = 23 * A.si + 7 * A.sk)$ |
| $A \rightarrow a A_1$ | $A.si := A_1.si + 1$ $A.sj := A_1.sj$ $A.sk := A_1.sk$ |
| $A \rightarrow B$ | $A.si := 0$ $A.sj := B.sj$ $A.sk := B.sk$ |
| $B \rightarrow b B_1$ | $B.sj := B_1.sj + 1$ $B.sk := B_1.sk$ |
| $B \rightarrow C$ | $B.sj := 0$ $B.sk := C.sk$ |
| $C \rightarrow c C_1$ | $C.sk := C_1.sk + 1$ |
| $C \rightarrow \epsilon$ | $C.sk := 0$ |

Vérification positive avec le mot $\epsilon \notin L_3$



Vérification positive avec le mot $aaabbbbbbbbbbcb \in L_3$

[Voir page suivante]



(d)

Avec

(hpc = previous char),
(hpc = previous previous char),
(hn = number of `bac` occurrence),
(hfp = fibonnaci previous),
(hfc = current fibonnaci value)

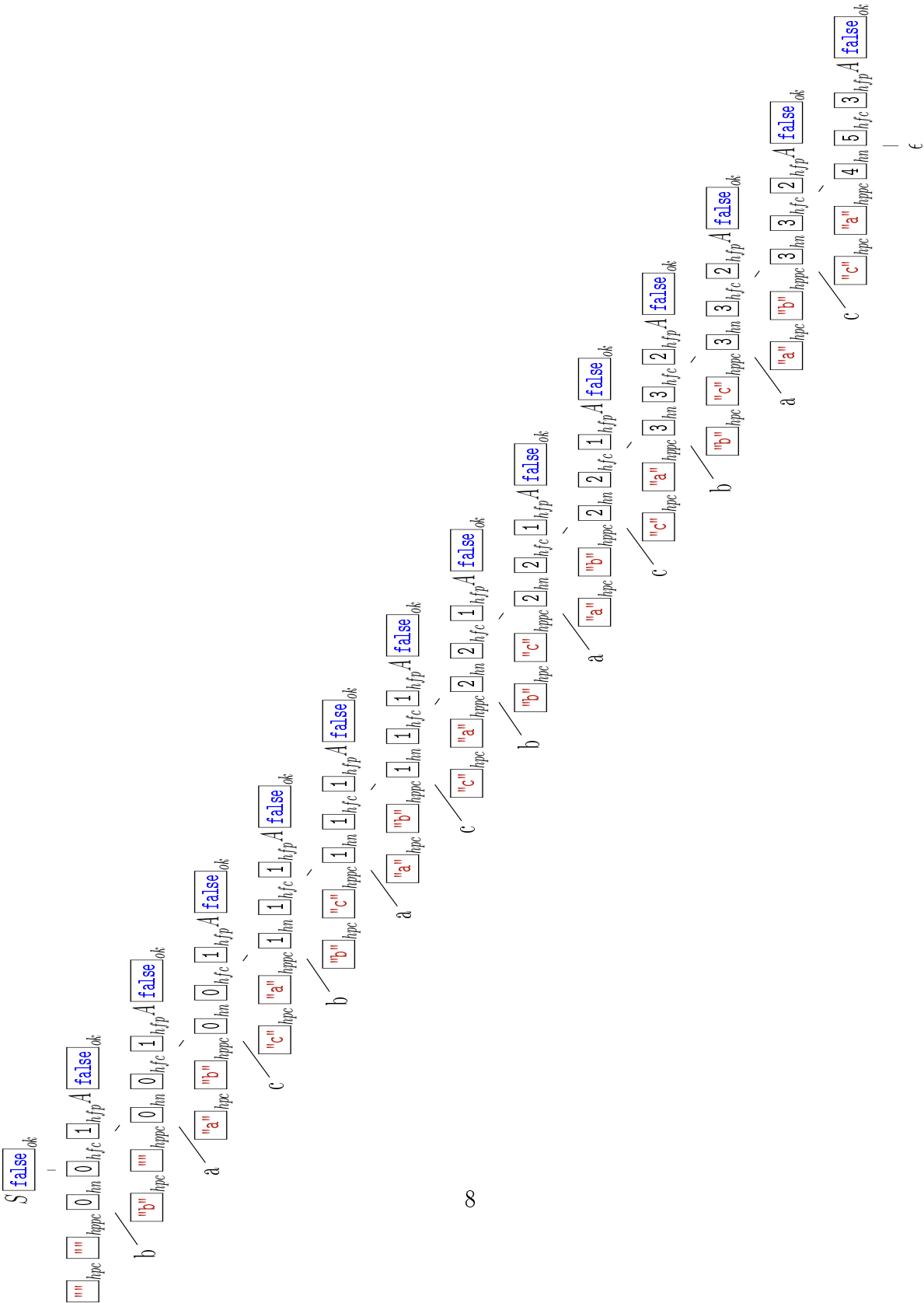
[Voir page suivante]

| Productions | Règles Sémantiques |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $S \rightarrow A$ | $A.hpc := ""$ $A.hppc := ""$ $A.hn := 0$ $A.hfc := 0$ $A.hfp := 1$ $S.ok := A.ok$ |
| $A \rightarrow a A_1$ | $A_1.hpc := "a"$ $A_1.hppc := A.hpc$ $A_1.hn := A.hn$ $A_1.hfc := A.hfc$ $A_1.hfp := A.hfp$ $A.ok := A_1.ok$ |
| $A \rightarrow b A_1$ | $A_1.hpc := "b"$ $A_1.hppc := A.hpc$ $A_1.hn := A.hn$ $A_1.hfc := A.hfc$ $A_1.hfp := A.hfp$ $A.ok := A_1.ok$ |
| $A \rightarrow c A_1$ | $A_1.hpc := "c"$ $A_1.hppc := A.hpc$ $A_1.hn := \text{if } A.hpc = "a" \text{ and } A.hppc = "b" \text{ then } A.hn + 1 \text{ else } A.hn$ $A_1.hfc := \text{if } A_1.hn > A.hfc \text{ then } A.hfp + A.hfc \text{ else } A.hfc$ $A_1.hfp := \text{if } A_1.hn > A.hfc \text{ then } \max(1, A.hfc) \text{ else } A.hfp$ $A.ok := A_1.ok$ |
| $A \rightarrow \epsilon$ | $A.ok := A.hfc = A.hn$ |

Vérification positive avec le mot $\epsilon \in L_4$

$$\begin{array}{c}
 S \boxed{\text{true}}_{ok} \\
 | \\
 \boxed{""}_{hpc} \boxed{""}_{hppc} \boxed{0}_{hn} \boxed{0}_{hfc} \boxed{1}_{hfp} A \boxed{\text{true}}_{ok} \\
 | \\
 \epsilon
 \end{array}$$

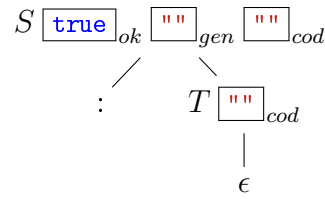
Vérification negative avec le mot *bachabachbac* $\notin L_4$



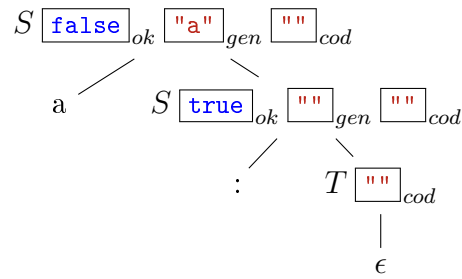
(e)

| Productions | Règles Sémantiques |
|--------------------------|-------------------------------------------------------------------------|
| $S \rightarrow a S_1$ | $S.gen := "00".S_1.cod$ $S.cod := T.cod$ $S.ok := S.gen = S.cod$ |
| $S \rightarrow b S_1$ | $S.gen := "010".S_1.cod$ $S.cod := T.cod$ $S.ok := S.gen = S.cod$ |
| $S \rightarrow c S_1$ | $S.gen := "001".S_1.cod$ $S.cod := T.cod$ $S.ok := S.gen = S.cod$ |
| $S \rightarrow d S_1$ | $S.gen := "1".S_1.cod$ $S.cod := T.cod$ $S.ok := S.gen = S.cod$ |
| $S \rightarrow : T$ | $S.gen := ""$ $S.cod := T.cod$ $S.ok := S.gen = S.cod$ |
| $T \rightarrow 0 T_1$ | $T.cod := "0".T_1.cod$ |
| $T \rightarrow 1 T_1$ | $T.cod := "1".T_1.cod$ |
| $T \rightarrow \epsilon$ | $T.cod := ""$ |

Vérification positive avec le mot $:$ $\in L_5$



Vérification négative avec le mot a : $\notin L_5$



Question 2

| Productions | Règles Sémantiques |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $S \rightarrow T$ | $T.hniv := 0$ $S.ok := T.okv \wedge T.okn$ |
| $T \rightarrow [T_1, \mathbf{num}, T_2]$ | $T_1.hniv := T.hniv + 1$ $T_2.hniv := T.hniv + 1$ $T.minv := \min(T_1.minv, \mathbf{num.lexval}, T_2.minv)$ $T.maxv := \min(T_1.maxv, \mathbf{num.lexval}, T_2.maxv)$ $T.maxn := T_1.maxn$ $T.okv := T_1.maxv \leq \mathbf{num.lexval}$ $\quad \wedge \mathbf{num.lexval} \leq T_2.minv$ $\quad \wedge T_1.okv \wedge T_2.okv$ $T.okn := T_1.maxn = T_2.maxn$ $\quad \wedge T_1.okn \wedge T_2.okn$ |
| $T \rightarrow [T_1, \mathbf{num}_1, T_2, \mathbf{num}_2, T_3]$ | $T_1.hniv := T.hniv + 1$ $T_2.hniv := T.hniv + 1$ $T_3.hniv := T.hniv + 1$ $T.minv := \min(T_1.minv, \mathbf{num}_1.lexval,$ $\quad T_2.minv, \mathbf{num}_2.lexval, T_3.minv)$ $T.maxv := \min(T_1.maxv, \mathbf{num}_1.lexval,$ $\quad T_2.maxv, \mathbf{num}_2.lexval, T_3.maxv)$ $T.maxn := T_1.maxn$ $T.okv := T_1.maxv \leq \mathbf{num}_1.lexval$ $\quad \wedge \mathbf{num}_1.lexval \leq T_2.minv$ $\quad \wedge T_2.maxv \leq \mathbf{num}_2.lexval$ $\quad \wedge \mathbf{num}_2.lexval \leq T_3.minv$ $\quad \wedge T_1.okv \wedge T_2.okv \wedge T_3.okv$ $T.okn := T_1.maxn = T_2.maxn$ $\quad \wedge T_2.maxn = T_3.maxn$ $\quad \wedge T_1.okn \wedge T_2.okn \wedge T_3.okn$ |
| $T \rightarrow []$ | $T.minv := \infty$ $T.maxv := -\infty$ $T.maxn := T.hniv$ $T.okv := \text{true}$ $T.okn := \text{true}$ |

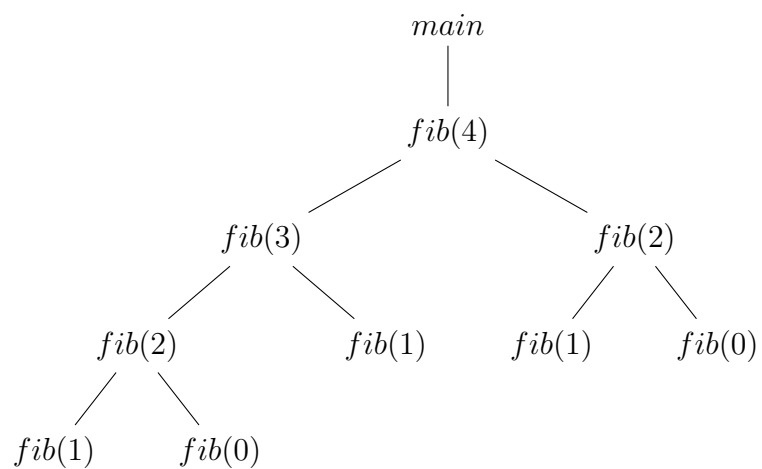
Question 3

| | | | |
|-----|---------------|------------------|---------------------------------------------------|
| E | \rightarrow | T | $\{ X.i := T.b \}$ |
| | | X | $\{ E.b := X.b \}$ |
| X | \rightarrow | ou T | $\{ X_1.i := X.i \vee T.b \}$ |
| | | X_1 | $\{ X.b := X_1.b \}$ |
| X | \rightarrow | ϵ | $\{ X.b := X.i \}$ |
| T | \rightarrow | F | $\{ Y.i := F.b \}$ |
| | | Y | $\{ T.b := Y.b \}$ |
| Y | \rightarrow | et F | $\{ Y_1.i := Y.i \wedge F.b \}$ |
| | | Y_1 | $\{ Y.b := Y_1.b \}$ |
| Y | \rightarrow | ϵ | $\{ Y.b := Y.i \}$ |
| F | \rightarrow | non F_1 | $\{ F.b := \neg F_1.b \}$ |
| | $ $ | A | $\{ F.b := A.b \}$ |
| A | \rightarrow | (E) | $\{ A.b := E.b \}$ |
| | $ $ | faux | $\{ A.b := \text{faux} \}$ |
| | $ $ | vrai | $\{ A.b := \text{vrai} \}$ |
| | $ $ | id | $\{ A.b := \text{get_value}(\text{id.entry}) \}$ |

Question 4

| Productions | Règles Sémantiques |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $S \rightarrow \text{swith } E \text{ with } C$ | $C.exit := \text{new Label}$ $C.temp := E.place$ $S.code := E.code C.code$ |
| $C \rightarrow \text{case } K \text{ } S ; C_1$ | $C_1.exit := C.exit$ $K.temp := C.temp$ $K.begin := \text{new Label}$ $K.end := \text{new Label}$ $C.code := K.code S.code$ $\quad \text{gen('goto' } C.exit)$ $\quad \text{gen}(K.end \text{ ' :'})$ $\quad C_1.code$ |
| $C \rightarrow \text{else } S$ | $C.code := S.code$ |
| $C \rightarrow \text{end}$ | $C.code := \text{gen}(C.exit \text{ ' :'})$ |
| $K \rightarrow \text{num} , K_1$ | $K_1.begin := K.begin$ $K_1.end := K.end$ $K_1.temp := K.temp$ $K.code := \text{gen('if' } K.temp \text{ '='}$ $\quad \text{num.val 'goto' } K.begin)$ $\quad K_1.code$ |
| $K \rightarrow \text{num} :$ | $K.code := \text{gen('if' } K.temp \text{ '='}$ $\quad \text{num.val 'goto' } K.begin)$ $\quad \text{gen('goto' } K.end)$ $\quad \text{gen}(K.begin \text{ ' :'})$ |

Question 5



Question 6

| Variable | Durée vie | Alloc. | Affect |
|----------------|-----------|--------|--------|
| t ₁ | 1—10 | reg. | R1 |
| t ₂ | 1—5 | reg. | R2 |
| t ₃ | 3—4 | reg. | R3 |
| t ₄ | 4—5 | reg. | R3 |
| t ₅ | 5—6 | reg. | R3 |
| t ₆ | 6—10 | reg. | R3 |
| t ₇ | 7—11 | reg. | R2 |
| t ₈ | 8—9 | reg. | R4 |
| t ₉ | 10—11 | reg. | R1 |
| z1 | ∀ | mem. | — |
| z2 | ∀ | mem. | — |
| a | ∀ | mem. | — |
| b | ∀ | mem. | — |
| c | ∀ | mem. | — |