Quiz 4 - CFGs, Lambda Calc, OpSem

Q1 CFGs

7 Points

Q1.1 Ambiguous

3 Points

Prove that the following grammar is ambiguous:

```
S → bS | Sb | T
T → Sa | Sb | Sc | ϵ
```

S -> Sb -> bSb -> bTb -> bb
S -> bS -> bSb -> bTb -> bb

Save Answer

Q1.2 Modify The CFG

4 Points

Given the following ambiguous CFG, modify it so that it produces the same strings but is not ambiguous. You can use ϵ, e, or epsilon.

```
S → SaS | T
T → bT | V
V → c | ϵ
```

S -> TaS | T
T -> bT | V
V -> C | ϵ

Save Answer

Q2 Operational Semantics

10 Points

Given the following operational semantics rules:

$$\frac{}{A;\ \mathrm{n} \Rightarrow \mathrm{n}} \qquad \frac{A(\mathrm{x}) = \mathrm{v}}{A;\ \mathrm{x} \Rightarrow \mathrm{v}}$$

$$\frac{A;\ \mathrm{e}_1 \Rightarrow \mathrm{v}_1 \qquad A;\ \mathrm{e}_2 \Rightarrow \mathrm{v}_2 \qquad \mathrm{v}_3 \text{ is } \mathrm{v}_1 = \mathrm{v}_2}{A;\ \mathrm{e}_1 = \mathrm{e}_2 \Rightarrow \mathrm{v}_3}$$

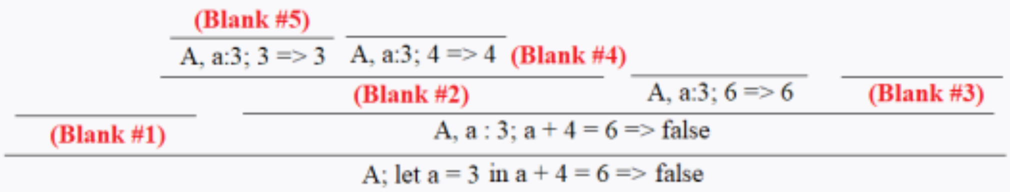
$$\frac{A;\ \mathrm{e}_1 \Rightarrow \mathrm{v}_1 \qquad A, \mathrm{x} : \mathrm{v}_1;\ \mathrm{e}_2 \Rightarrow \mathrm{v}_2}{A;\ \text{let x} = \mathrm{e}_1 \text{ in } \mathrm{e}_2 \Rightarrow \mathrm{v}_2}$$

$$\frac{A;\ \mathrm{e}_1 \Rightarrow \mathrm{v}_1 \qquad A;\ \mathrm{e}_2 \Rightarrow \mathrm{v}_2 \qquad \mathrm{v}_3 \text{ is } \mathrm{v}_1 + \mathrm{v}_2}{A;\ \mathrm{e}_1 + \mathrm{e}_2 \Rightarrow \mathrm{v}_3}$$

Q2.1 Complete the OpSem

10 Points

Fill the blanks so that the following is valid



Blank #1:

$A; 3 \Rightarrow 3$

Blank #2:

$A, a : 3; a + 4 \Rightarrow 7$

Blank #3:

false is 7 = 6

Blank #4:

7 is 3 + 4

Blank #5:

$A, a : 3(x) = 3$ (due to typo we also accept empty making this an axiom)

Save Answer

Q3 Lambda Calculus

3 Points

What does this evaluate to?

```
(( λx. λa. λb. x b a) (λx. λy. x)) (λy. y)
```

- (λy.(λy.y))
- (λb.b) (selected)
- (λx.λy.x)
- None of the above

Save Answer

Save All Answers

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