Quiz 3 from Fall 2020 (Practice)

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STUDENT NAME

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Q1 First Sets

3 Points

Consider the following CFG:

Q1.1

1 Point

Which non-terminals are in the first set of S?



Save Answer

Q1.2

1 Point

Which non-terminals are in the first set of T?

x	
y	
$\Box \varepsilon$	

Save Answer

Q1.3

1 Point

Which non-terminals are in the first set of V?

x	
y	
$\Box \varepsilon$	

Save Answer

Q2 Parsing

6 Points

Consider the following CFG:

 $S \to \mathbf{xy}S\mathbf{z} \mid \mathbf{x}T\mathbf{y}\mathbf{z}$ $T \to \mathbf{w}T \mid \varepsilon$

Complete the parse_S and parse_T functions below, which should parse T and S, respectively. Your functions should not return anything, but should fail if the input is invalid (if the input is valid, simply return ()).

The structure of the program is as follows:

```
let rec parse_S toks =
    (* TODO *)
and rec parse_T toks =
    (* TODO *)
```

The *lookahead* and *match_tok* functions are provided below:

Implement parse_S below of type string list -> unit. The first line of your answer should be let rec parse_S toks =. Enter your answer here Save Answer Q2.2 3 Points Implement parse_T below of type string list -> unit. The first line of your answer should be and rec parse_T toks =. Enter your answer here Save Answer Q3 CFG Construction 3 Points Construct a CFG that generates strings of the form $a^x b^y$ where $y \ge 2x$.

Enter your answer here

Save Answer

Q4 Ambiguous Grammars 2 Points

Consider the following CFG:

 $S
ightarrow \mathbf{a} S \mid \mathbf{a} T$ $T
ightarrow \mathbf{a} \mid \mathbf{b} \mid arepsilon$

Prove that this grammar is ambiguous.

Enter your answer here

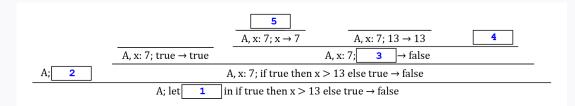
Save Answer

Q5 Operational Semantics

6 Points

$\overline{A;n \to n}$	$\frac{A(x) = v}{A; x \to v}$	$\begin{array}{ccc} A; e_1 \to v_1 & A, x: v_1; e_2 \to v_2 \\ \hline A; \ \mathbf{let} \ x = e_1 \ \mathbf{in} \ e_2 \to v_2 \end{array}$
		$\begin{array}{c c} A; e_1 \rightarrow n_1 & A; e_2 \rightarrow n_2 & n_1 \leq n_2 \\ \hline A; e_1 > e_2 \rightarrow \textbf{false} \end{array}$
$\frac{A; e_1 \to \mathbf{true}}{A; \text{ if } e_1 \text{ then } e_2 \text{ of } e_1}$		$\begin{array}{ccc} A; e_1 \to \mathbf{false} & A; e_3 \to v \\ \hline A; \ \mathbf{if} \ e_1 \ \mathbf{then} \ e_2 \ \mathbf{else} \ e_3 \to v \end{array}$

Using the above rules, fill in the blanks in the derivation show below:



IMPORTANT: Double-check that the BLUE box numberings correspond with your answers; the boxes are numbered from bottom to top. We will not accept out-of-order answers.

Blank 1:

Enter your answer here

Blank 2:

Enter your answer here

Blank 3:

Enter your answer here

Blank 4:

Enter your answer here

Blank 5:

Enter your answer here

Save Answer

Save All Answers