



## CMSC330 Spring 2024 Quiz 3

Proctoring TA: \_\_\_\_\_ Name: \_\_\_\_\_

Section Number: \_\_\_\_\_ UID: \_\_\_\_\_

### Problem 1: Context Free Grammars - Derivations

[Total 8 pts]

Consider the following Grammar:

```
S -> if S then S T | U
T -> else S | ε
U -> 'hello' | 'bye' | true | false
```

(a) Is this an ambiguous grammar?

[2 pts]

A Yes     B No

(b) Derive "if if true then 'hello' else 'bye' then false"

[6 pts]

## Problem 2: Context Free Grammars - Creation

[Total 4 pts]

(a) Design a CFG that represents the same set of strings as the regular expression:  $(d|e)^*f^+$

[4 pts]

## Problem 3: Lexing Parsing and Evaluating

[Total 8 pts]

Given the following CFG, and assuming the **Ocaml** type system, at what stage of language processing would each expression **fail**? Mark **'Valid'** if the expression would be accepted by the grammar and evaluate properly. Assume the only symbols allowed are those found in the grammar.

$$E \rightarrow M \text{ and } E|M \text{ or } E|M$$

$$M \rightarrow N + M|N - M|N$$

$$N \rightarrow 1|2|3|4|\text{true}|\text{false}|(E)$$

	Lexer	Parser	Evaluator	Valid
1 + 2 - (true and false)	<input type="radio"/> L	<input type="radio"/> P	<input type="radio"/> E	<input type="radio"/> V
{2}	<input type="radio"/> L	<input type="radio"/> P	<input type="radio"/> E	<input type="radio"/> V
3 * 1 - 2	<input type="radio"/> L	<input type="radio"/> P	<input type="radio"/> E	<input type="radio"/> V
2 and 5	<input type="radio"/> L	<input type="radio"/> P	<input type="radio"/> E	<input type="radio"/> V
false	<input type="radio"/> L	<input type="radio"/> P	<input type="radio"/> E	<input type="radio"/> V
true and (false)	<input type="radio"/> L	<input type="radio"/> P	<input type="radio"/> E	<input type="radio"/> V
(1) + (4)	<input type="radio"/> L	<input type="radio"/> P	<input type="radio"/> E	<input type="radio"/> V
(({2}))	<input type="radio"/> L	<input type="radio"/> P	<input type="radio"/> E	<input type="radio"/> V