CS 181 HW8 2021 CS181

CHARLES ZHANG

TOTAL POINTS

12 / 12

QUESTION 1

1 Two left-most reductions in CFG 4 / 4

✓ **- 0 pts Perfectly correct**

- 1.5 pts One of your reductions is wrong

- 3 pts Both of your reductions are wrong

- 1 pts Reduction is correct, but one of your reductions is not left-most

- 2 pts Reduction is correct, but both of your reductions are not left-most

- 4 pts Did not answer this question

QUESTION 2

TM (mixed) Construction 8 pts

2.1 a. Procdure 6 / 6

✓ **+ 6 pts Correct**

+ 4 pts Partially correct

+ 2 pts Attempted

+ 5 pts Almost Correct

+ 0 pts Not attempted

2.2 b. Brief explanation 2 / 2

✓ **+ 2 pts Correct**

+ 1 pts Attempted, partially correct

+ 0 pts Not attempted or wrong

CS 181 Homework 8

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Problem 1

Leftmost Reduction #1:
baabba
Baabba
BAabba
BAAbba
BCbba
Abba
ABba
ABBa
ADa
Ba
BA
S

Leftmost Reduction #2:
baabba
Baabba
BAabba
BAAbba
BAABba
BASba
BAba
BABa
BSa
Ba
BA
S

1 Two left-most reductions in CFG 4 / 4

✓ **- 0 pts** **Perfectly correct**

- 1.5 pts One of your reductions is wrong

- 3 pts Both of your reductions are wrong

- 1 pts Reduction is correct, but one of your reductions is not left-most

- 2 pts Reduction is correct, but both of your reductions are not left-most

- 4 pts Did not answer this question

Problem 2

a) Proof (by construction):

- Let M_P be a Turing Machine that recognizes L_P.
- Let M_A be a Turing Machine that decides L_A.
- Construct M for $L_P \cup L_A$.
- Use UTM to simulate M_A on a given input w.
  - Since M_A decides a language, it's guaranteed to halt.
- If M_A halts and accepts, M halts and accepts.
- Else (M_A has halted and rejected):
  - Use UTM to simulate M_P on w (this may enter an infinite loop).
  - If M_P halts and accepts, M halts and accepts.
  - If M_P halts and rejects, M halts and rejects.

b) Justification:
By definition, a machine that recognizes the language $L_P \cup L_A$, must recognize every string in L_P. Since L_P is an RE language, we cannot guarantee that all strings recognized by M_P cause M_P to halt. As a result, we must account for the possibility that some strings in L_P cannot be decided, only recognized. Therefore, the language $L_P \cup L_A$ cannot be assumed to be recursive, it must be RE.

2.1 a. Procdure 6 / 6

- ✓ **+ 6 pts** **Correct**
- **+ 4 pts** Partially correct
- **+ 2 pts** Attempted
- **+ 5 pts** Almost Correct
- **+ 0 pts** Not attempted

2.2 b. Brief explanation **2 / 2**

✓ **+ 2 pts** **Correct**

+ 1 pts Attempted, partially correct

+ 0 pts Not attempted or wrong