COMPSCI/SFWRENG 2FA3

Discrete Mathematics with Applications II

Winter 2021

Assignment 7

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Assignment 7 consists of two problems. You must write your solutions to the problems using LaTeX.

Please submit Assignment 7 as two files, `Assignment_7_`*`YourMacID`*`.tex` and `Assignment_7_`*`YourMacID`*`.pdf`, to the Assignment 8 folder on Avenue under Assessments/Assignments. *`YourMacID`* must be your personal MacID (written without capitalization). The `Assignment_7_`*`YourMacID`*`.tex` file is a copy of the LaTeX source file for this assignment (`Assignment_7.tex` found on Avenue under Contents/Assignments) with your solution entered after each problem. The `Assignment_7_`*`YourMacID`*`.pdf` is the PDF output produced by executing

```
pdflatex Assignment_7_YourMacID
```

This assignment is due **Monday, March 22, 2021 before midnight.** You are allow to submit the assignment multiple times, but only the last submission will be marked. **Late submissions and files that are not named exactly as specified above will not be accepted!** It is suggested that you submit your preliminary `Assignment_7_`*`YourMacID`*`.tex` and `Assignment_7_`*`YourMacID`*`.pdf` files well before the deadline so that your mark is not zero if, e.g., your computer fails at 11:50 PM on March 22.

Although you are allowed to receive help from the instructional staff and other students, your submission must be your own work. Copying will be treated as academic dishonesty! If any of the ideas used in your submission were obtained from other students or sources outside of the lectures and tutorials, you must acknowledge where or from whom these ideas were obtained.

Problems

1. **[10 points]** Construct a grammar for the following language:

$$\Big\{a^n(bc)^m \in \{a,b,c\}^* \mid m,n \geq 1 \wedge m < \lfloor \frac{n}{2} \rfloor \Big\}.$$

Hint: Floor function on x, written as $\lfloor x \rfloor$, is the greatest integer that is less than or equal to x.

Aamina Hussain, hussaa54, March 21, 2021
Let G be a grammar for the above language.

$G = (\{S, S_1, A\}, \{a, b, c\}, P, S)$

P is the set of productions

$S \rightarrow aaaabc \mid aaaaAbc \mid aaaaS_1bc$
$S_1 \rightarrow aabc \mid aaS_1bc$
$A \rightarrow a \mid aS_1 \mid aA$

2. **[10 points]** Construct a grammar that generates the language of all the strings on the alphabet $\Sigma = \{0, 1\}$ that are not palindromes. Construct a regular grammar if the language is regular and construct a context-free grammar if the language is context-free but not regular.

Aamina Hussain, hussaa54, March 21, 2021
Let G be a grammar that generates the language of all the strings on Σ that are not palindromes.

$G = (\{S, A\}, \{0, 1\}, P, S)$

P is the set of productions

$S \rightarrow 1S1 \mid 0S0 \mid 0A1 \mid 1A0$
$A \rightarrow 0A \mid 1A \mid \epsilon$