COSC 2001A 3.0—Fall 2000

Posted: Nov 14, 2000

Due: TBA, after the conclusion of the current Labour dispute.

ALTERNATE Problem Set No. 2—*For Section A only.*

This Problem Set # 2 is for those, and *only those*, students who were unable to fulfil their course requirements in COSC 2000A as a result of the current Labour dispute.

It provides an alternative opportunity to complete required course work, and provides alternative extended deadlines.

Papers ***must*** **be typed or word-processed (the "*must*" does not apply to diagrams)**, and deposited in a course drop-box on the due date.

► **Due time:** Any time on the due date, which is TBA, after the strike. **The Box will be cleared the following morning. Location of the drop-box:** There is box labelled 2001A on the first floor of CCB, in the corridor that leads to the Ariel Lab.◄

In this ALTERNATIVE Problem Set it is still allowed—but not required!—to submit **ONE joint paper that has a total of TWO co-authors from the same section**. The same mark, as assigned to such a joint paper, will be given to **each** of its two authors.

► **IFF** you are submitting ALTERNATE Problem Set #2 ***with*** a partner, then you ***must*** notify me (in the usual manner) as described below, **Prtnr1.**–**Prtnr4.:**

Prtnr1. Make a file called "partner" (no quotes). [Please do ***not*** call it "Partner" or "PARTNER" or "a2partner" or anything other than "partner"].

Prtnr2. Put in it your name and "ariel" login, ***and*** the name and ariel login of your partner as well.

Prtnr3. Give the following command on ariel

"**submit 2001 a2alt partner**"

Prtnr4. Only ***one*** submission (**Prtnr3.**, above) ***per pair*** please! ◄

If you do NOT plan to work with a partner please do NOT submit any co-author information!

General Remark. Each solution must contain *adequate explanation(s)* of *why* it answers the relevant question. While examples can help one understand your point of view, *they are NOT substitutes* for a logical argument that establishes your solution's validity ***in general***.

1. From the text (Sipser, **p.120 onwards**) do:

(i) **#2.4(a, d, f)**
(ii) **#2.6b**
(iii) **#2.12**
(iv) **#2.14**
(v) **#2.15**
(vi) **#2.16**
(vii) **#2.18(b)**
(viii) **#2.19**
(ix) **#2.23**

2. Sipser shows in Chapter 2, Section titled "**Designing Context-Free Grammars**", that a CFG with rules **only** of the two types $A \to a$ and $A \to aB$ ($a \in \Sigma_\varepsilon$) necessarily produces a regular language.

► Prove that the same is true for any CFG that exclusively has rules of the types $A \to a$ and $A \to Ba$ ($a \in \Sigma_\varepsilon$).

(*Hint.* Imitate Sipser's argument to see how a DFA (or an NFA, if more convenient) can be "simulated" by such a grammar, and conversely, how a DFA might parse the strings generated by such a grammar.)

3. Prove that regular languages are closed under reversal, that is, if L is regular, then so is L^R, where L^R denotes the set of the *reversals* of *all the strings of* L.