

Lassonde Faculty of Engineering
EECS

EECS2001B. Problem Set No1

Posted: Sept. 19, 2020

Due: Oct. 21, 2020, by **3:00pm**; in the course's **eClass**, "**Assignment #1**".

Q: *How do I submit?*

A:

- (1) **The text of all answers is expected to be typed.**
- (2) **Submission must be ONLY ONE file**
- (3) **Accepted File Types: PDF, RTF, MS WORD, ZIP**
- (4) **Deadline is strict, electronically limited.**
- (5) **MAXIMUM file size = 10MB**



It is worth remembering (quoted from the course outline):

The answers must be typed (but you may draw symbols by hand, if it is easier for you).

The homework must be each individual's own work. While consultations with the instructor, tutor, and among students, are part of the learning process and are encouraged, *at the end of all this consultation* each student will have to produce an individual report rather than a copy (full or partial) of somebody else's report.

The concept of "late assignments" does not exist in this course.



1. (5 MARKS) By **induction on the length of derivations** prove that $\mathcal{PR} \subseteq P$.
2. (2 MARKS) Using the preceding problem conclude that $\mathcal{PR} \subseteq R$.
3. (5 MARKS) Prove that the function

$$k \text{ 2s } \left\{ \begin{array}{l} 2^x \\ 2^{2^x} \\ \dots \\ 2^{2^{2^{\dots 2^x}}} \end{array} \right.$$

is in \mathcal{PR} .

4. p.234 of the text, Section 2.12: Do
 - (a) (5 MARKS) Do Exercise 2.1.2.43, p.113
 - (b) (5 MARKS) Problem 2 (5 MARKS) \Leftarrow **Omit!**
 - (c) (5 MARKS) Problem 3 (5 MARKS) \Leftarrow **Omit!**
 - (d) (5 MARKS) Problem 6 (5 MARKS)
 - (e) (5 MARKS) Solve problem 15, for $k = 3$ *without nesting*
Loop-end instructions!

5. (5 MARKS) Put the recursion

$$\begin{aligned} sw(0, y, z) &= y \\ sw(x + 1, y, z) &= z \end{aligned}$$

in normal primitive recursion form.

6. (5 MARKS) Show that the function in problem #3 above can be programmed by a Loop-program that does not nest **Loop-end** instructions in depth more than two such instructions.