Programming Paradigms Exam – 20 January 2020

Work Time: 2 hours

Default 1p

Problem 1 (3p): Please write a function {SndPosition Xs Y} that returns the position of the second occurrence of Y in the list Xs. The positions in a list start with 1. For example, {SndPosition [c a b c] c} returns 4, {SndPosition [a b c] b} returns 0, {SndPosition [c a b c d c e] c} returns 4 and {SndPosition [a b c b] e} returns 0.

Problem 2 (3p): Suppose that you are given a boolean expression described by a tree constructed from tuples as follows:
1. A boolean is described by a tuple boolval(N), where N is either true or false.
2. A conditional is described by a tuple boolif(X Y Z), where X, Y, and Z are boolean expressions. If X is evaluated to true, the evaluation of the conditional expression returns the evaluation of the expression Y. Otherwise, it returns the evaluation of the expression Z.
3. A logical negation is described by a tuple boolnot(X), where X is a boolean expression. Implement a function Eval that takes a boolean expression and returns its value. For example, (boolif((boolval(true) (boolnot(boolval(false))) (boolval(true)))) is a boolean expression and its evaluation returns true.

Problem 3 (3p): Please write a producer which would produce a list of powers of 2 (starting from N) and a consumer which would compute the min/max values. Write this as a concurrent program with two threads such that we have a producer-driven concurrent computation.