Practical Subjects – 22 January 2019

Work Time: 2 hours
Please implement in Java the following two problems.
If a problem implementation does not compile or does not run you will get 0 points for that problem (that means no default points)!!!

1. **(0.5p by default) Problem 1: Implement Relational expressions in ToyLanguage.**
   a. (2.75p). Define the new expressions:
   NOT (exp)
   exp1 AND exp2
   exp1 OR exp2
   Since in our toy language we do not have boolean values, you must use the c-like convention: 0 represents False and any other integer value represents True. Expression exp1 AND exp2 is evaluated to 1 if both exp1 and exp2 are different than 0 and it is evaluated to 0 if one of the expressions exp1 or exp2 is 0. Expression exp1 OR exp2 is evaluated to 1 if at least one of exp1 and exp2 is 1 and it is evaluated to 0 if both exp1 and exp2 are 0. Expression not(exp) is evaluated to 1 if exp is 0 and it is evaluated to 0 if exp is 1.
   For the expression evaluation you must ignore the precedence order of the operators. The order is given by the user when the expression is introduced.
   b. (1.75p). Show the step-by-step execution of the following program. At each step display the content of each program state (all the structures of the program state). The step-by-step execution must be displayed on the screen and also must be saved into a text readable log file.
   The following program must be hard coded in your implementation:
   v1=20;v2=10; (if (v1 AND (v2-10)) then v1=v1 OR v2;print(NOT(v1)) else print (NOT(v1-20))
   The final Out should be {1}
2. **(0.5p by default) Problem 2: Implement Repeat-Until statement in Toy Language.**
   a. (2.75p). Define the new statement:
   repeat stmt until(exp)
   Its execution on the ExeStack is the following:
   - pop the statement
   - push stmt;(if(exp) then print(0) else (repeat stmt until (exp))) on the stack

   b. (1.75p). Show the step-by-step execution of the following program. At each step display the content of each program state (all the structures of the program state). The step-by-step execution must be displayed on the screen and also must be saved into a text readable log file.
   The following program must be hard coded in your implementation:
   v=4;w=0; repeat print(v);v=v-1;(if v then w=0 else w=1) until (w)
   The final Out should be {4,3,2,1,0}