Functional and logic programming
- ## written exam -

Important:
1. Subjects are graded as follows: By default - 1p; A – 2p; B - 4p; C - 3p.
2. Prolog problems will be resolved using SWI Prolog. The following are required: (1) explanation of the code and of the reasoning behind it; (2) recursive model that solves the problem, for all the predicates used; (3) specification of every predicate (parameters and their meaning, flow model, type of the predicate - deterministic/non-deterministic).
3. Lisp problems will be resolved using Common Lisp. The following are required: (1) explanation of the code and of the reasoning behind it; (2) recursive model that solves the problem, for each function used; (3) specification of every function (parameters and their meaning).

A. The following function definition in LISP is given

```
(DEFUN F(L)
       (COND
              ((NULL L) 0)
              ((> (F (CAR L)) 1) (F (CDR L)))
              (T (+ (F (CAR L)) (F (CDR L)))))
       )
)
```

Rewrite the definition in order to avoid the double recursive call **(F (CAR L))**. Do NOT redefine the function. Do NOT use SET, SETQ, SETF. Justify your answer.

B. Write a PROLOG program that generates the list of all subsets with N elements, using the elements of a list, such that the sum of elements from a subset is an even number. Write the mathematical models and flow models for the predicates used. For example, for the list L=[1, 3, 4, 2] and N=2 ⇒ [[1,3], [2,4]].

C. Given a nonlinear list, write a Lisp function to return the list with all atoms on even levels replaced by zero. The superficial level is assumed 1. **A MAP function shall be used.**
Example for the list (a (1 (2 b)) (c (d))) the result is (a (0 (2 b)) (0 (d))).