Functional and logic programming written exam -

Important:

- 1. Subjects are graded as follows: of 1p; A 1.5p; B 2.5p; C 2.5p; D 2.5p.
- 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(L1 L2)

 (APPEND (F (CAR L1) L2)

 (COND

 ((NULL L1) (CDR L2))

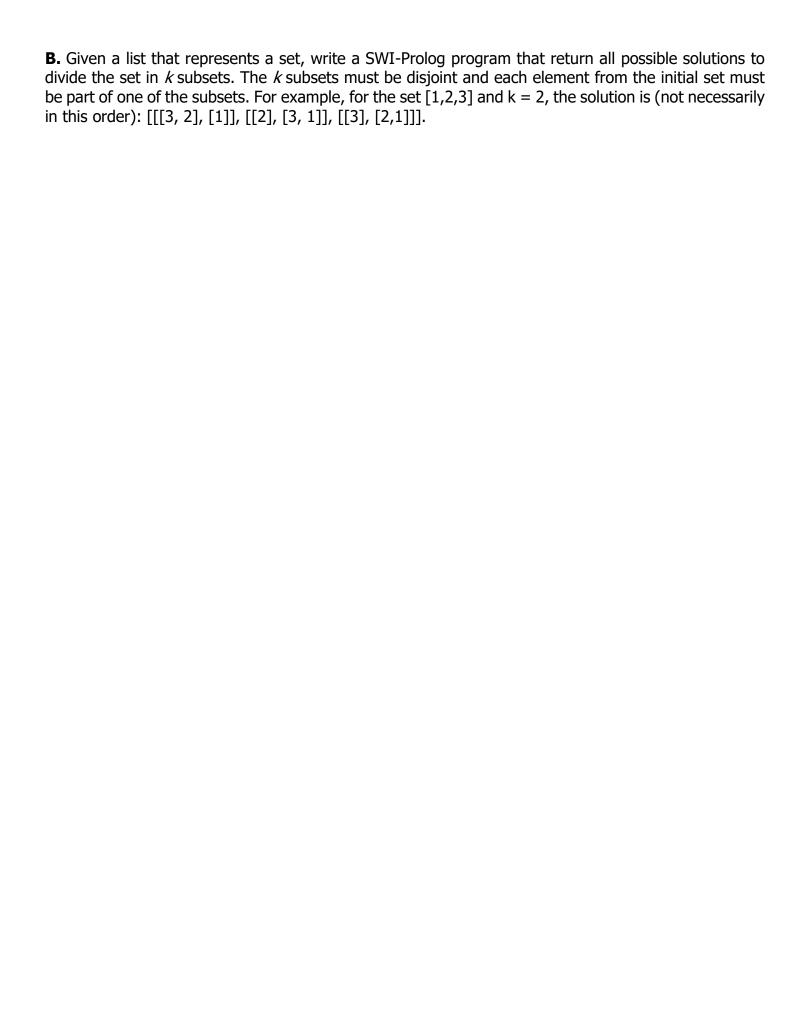
 (T (LIST (F (CAR L1) L2) (CAR L2)))

)

)

)

Rewrite the definition in order to avoid the double recursive call **(F (CAR L1) L2)**. Do NOT redefine the function. Do NOT use SET, SETQ, SETF. Justify your answer.0



C. Write a PROLOG program that generates the list of all permutations with the property the absolute value of difference between two consecutive values from each permutation is <=3. Write the mathematical models and flow models for the predicates used. For example, for $L=[2,7,5] \Rightarrow [[2,5,7], [7,5,2]]$ (not necessarily in this order).

D. Given a nonlinear list, write a Lisp function to replace all even numerical values with their natural successor. **A MAP function shall be used. Example** for the list (1 s 4 (2 f (7))) the result is (1 s 5 (3 f (7))).