ISEG, LISBON SCHOOL OF ECONOMICS AND MANAGEMENT

OPERATIONS RESEARCH PROJECT 2ND SEMESTER 2020/2021

An organization has identified seven species in risk of extinction. You have commited to help with associates from the organization by putting foward a plan for the survival of the species. To reach this goal, you have recollected the information that follows:

1) A map of the zone where you have identified the presence of these species, subdividing it by subzones.
2) A table where you registered the species presente in each of the subzones, 1 meaning presence and 0 meaning absence.

The proposal you intend to put forward consists of a selection of subzones. For the proposal to be eligible, the number of subzones selected must be as little as possible. The biological requirements make it absolutely necessary for each species to be present in, at least, 2 connected subzones – we shall cal them neighbours. In the figure below, you find the definition of being a neighbour. The + sign indicates the neighbours of the subzone i.

+	+	+
+	*i*	+
+	+	+

Identify the which selection of subzones should be presented to the organization.

Develop a constructive heuristic, a better heuristic (one that will take the first heuristic and analyze it to improve the results)

Presence of species in each subzone

	Species						
original	1	2	3	4	5	6	7
1	0	0	0	1	0	0	0
2	0	0	1	1	0	1	1
3	1	1	0	0	1	0	1
4	1	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	1	1	1	1	1	1
7	0	1	0	0	0	0	1
8	0	0	1	0	0	1	0
9	1	0	0	0	0	0	1
10	0	0	1	0	0	0	1
11	0	0	1	0	0	0	1
12	1	1	1	1	1	0	0
13	0	1	0	1	0	1	1
14	0	1	0	1	0	0	0
15	0	0	1	0	0	1	0
16	0	0	0	0	0	1	0
17	1	1	0	1	1	1	0
18	1	0	0	1	1	0	0
19	0	0	0	1	0	1	0
20	1	1	1	0	0	1	0
21	1	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	1	0	1	1
24	0	0	0	1	1	1	1
25	0	1	0	1	0	1	0

Subzones (row label)

Map of subzones

1	2	3		
4	5	6	7	
8	9	10	11	
12	13	14	15	16
17	18	19	20	
21	22	23	24	25