INSTITUTO SUPERIOR DE AGRONOMIA

Applied Operations Research - Module 3

15 July 2016 - Duration: 2h

Number: Name:

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1. Consider the linear programming model

$$\min Z = 10x + 20y + 5z \tag{1}$$
$$x + y + z \geq 100 \tag{2}$$
$$z \leq 50 \tag{3}$$
$$x \leq 25 \tag{4}$$
$$x, y, z \geq 0 \tag{5}$$

and the corresponding sensitivity report created by the Excel Solver (Tables 1 and 2).

Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
x	25	0	10	10	1E+30
y	25	0	20	1E+30	10
z	50	0	5	15	1E+30

Table 1: Variable cells (sensitivity report by the Excel Solver).

Name	Final Value	Shadow Price	Constant R.H. Side	Allowable Increase	Allowable Decrease
(2)	100	20	100	1E+30	25
(3)	50	-15	50	25	50
(4)	25	-10	25	25	25

Table 2: Constraints (sensitivity report by the Excel Solver).

a) Indicate an optimal solution to the problem and the corresponding value of the objective function.

b) Are there non-binding constraints?

c) Indicate an optimal solution and the corresponding value of the objective function if the objective function coefficient for

i) x was increased from 10 to 19

ii) y was decreased from 20 to 15.

d) If the objective function coefficient for z was increased from 5 to 25, it would be possible to indicate an optimal solution from the current sensitivity report?

e) By how much would the optimal value of the objective function change if the RHS of

i) constraint (2) was increased by one unit?

ii) constraint (3) was decreased by two units?

f) If the RHS of constraint (4) was increased from 25 to 51, it would be possible to obtain the new optimal value of the objective function with the current sensitivity report?