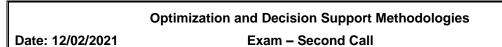
Duration: 2h



Note: Present all the calculations that you perform and justify your answers.

1. Consider the following Linear Programming problem:

Maximize
$$z = [-x_1 + 2x_2; 7x_1 + 21x_2]$$

subject to
 $7x_1 + 4x_2 \le 28$
 $-2x_1 + x_2 \le 2$
 $x_1 \ge 0$, $x_2 \ge 0$

[5.00 valores] a) Determine the set of efficient solutions and the set of non-dominated solutions using the graphical representation of this problem in the decision space and in the objective space;

[0.75 valores] b) Build the pay-off table and determine the ideal and anti-ideal solutions.

2. Consider the following Pure Integer Linear Programming problem:

Maximize
$$z = x_1 + 2x_2 + 3x_3$$

subject to
 $x_1 + 2x_3 \le 5$ (1)
 $2x_1 + x_2 \le 4$ (2)
 $x_1 - x_2 - x_3 \le 6$ (3)
 $x_1 \ge 0$, $x_2 \ge 0$, $x_3 \ge 0$
 x_1 , x_2 and x_3 integer

Assuming that x_4 , x_5 and x_6 are the slack variables associated with constraints (1), (2) and (3), respectively, suppose that the **Gomory algorithm** was applied to this same problem and that at the end of the 1st step, the following optimal tableau was obtained:

	Ci	1	2	3	0	0	0	
ΧB	C _B \ x i	X 1	X 2	Х3	X 4	X 5	X 6	b
X ₃	3	1/2	0	1	1/2	0	0	5/2
X_2	2	2	1	0	0	1	0	4
X 6	0	7/2	0	0	1/2	1	1	25/2
zj-cj		9/2	0	0	3/2	2	0	31/2

[5.00 valores]

a) Withdraw your conclusions and if necessary, proceed with the 2nd step of that algorithm;

[0.75 valores]

b) Could the restriction $x_1 + x_2 + x_3 \ge 4$ constitute an eventual cut constraint for this problem? Justify your answer.



3. Consider the following Goal Programming problem:

Minimize
$$z = \left\{ d_1^+, d_2^-, d_3^- \right\}$$

subject to
$$x_1 - x_2 + d_1^- - d_1^+ = 1$$

$$x_1 + d_2^- - d_2^+ = 1$$

$$x_2 + d_3^- - d_3^+ = 2$$

$$5x_1 + 3x_2 + d_4^- = 15$$

$$x_1 \ge 0, \quad x_2 \ge 0, \quad d_i^- \ge 0, \quad d_i^+ \ge 0 \quad (i = 1, 2, 3, 4)$$

[5.50 valores] Solve the problem using the **graphical method**.