

**ASSIGNMENT LINEAR PROGRAMMING****Due date: 23/12/23**

Please try to give clear and detailed answers. Remember this is a personal work.

**Part I (4 points)**

In a factory, 2 products P1 and P2 are manufactured using 3 kinds of raw material M1, M2, M3, which are available in limited quantities : 18 units of M1, 8 units of M2, 14 units of M3.

The following constraints need to be satisfied:

- to build 1 unit of P1, 1 unit of M1, 1 unit of M2, 2 units of M3 are required
- to build 1 unit of P2, 3 units of M1, 1 unit of M2, 1 units of M3 are required

Selling 1 unit of P1 makes an average benefit of 1€ and selling 1 unit of P2 makes an average benefit of 3€. The factory director wants to make the maximum possible benefit. Find the modelization of this problem and solve it.

**Part II (5 points)**

Solve the following problem:

$$\begin{aligned} \text{Max } w &= -4x - 10y - 5z \\ \text{s.t. } 5x + 20y + 15z &\geq 4 \\ -2x + 2y &\geq 10 \\ 5x - 15y + 10z &\geq -8 \end{aligned} \quad \text{with } x, y, z \geq 0$$

**Part III (2.5+2.5 points)**

a) Try to solve the problem using the simplex method : what happens? How do you explain this?

$$\begin{aligned} \text{Max } z &= 2x + y \\ \text{s.t. } x - 2y &\leq 2 \\ -2x + y &\leq 2 \\ x, y &\geq 0 \end{aligned}$$

b) You're solving a linear problem by using the simplex method and at some point you get the tableau

a	b	c	d	e	f	z		Sol
0	0	0	1	½	0	0		½
0	2	-4	0	-3	1	0		0
1	-1	3	0	-2	0	0		0
0	-2	1	0	4	0	1		4

Explain what happens. Could this situation have been avoided?

#### Part IV (6 points)

Solve the following problem:

$$\begin{aligned}
 &\text{Max } z = 12x + 20y \\
 &\text{s.t.} \quad \begin{aligned}
 &6x + 10y \geq 60 \\
 &8x + 25y \geq 200 \\
 &2x + 8y \leq 80
 \end{aligned} \\
 &\text{with } x, y \geq 0
 \end{aligned}$$