Optimization and Decision Support Methodologies
2nd Assessment Test

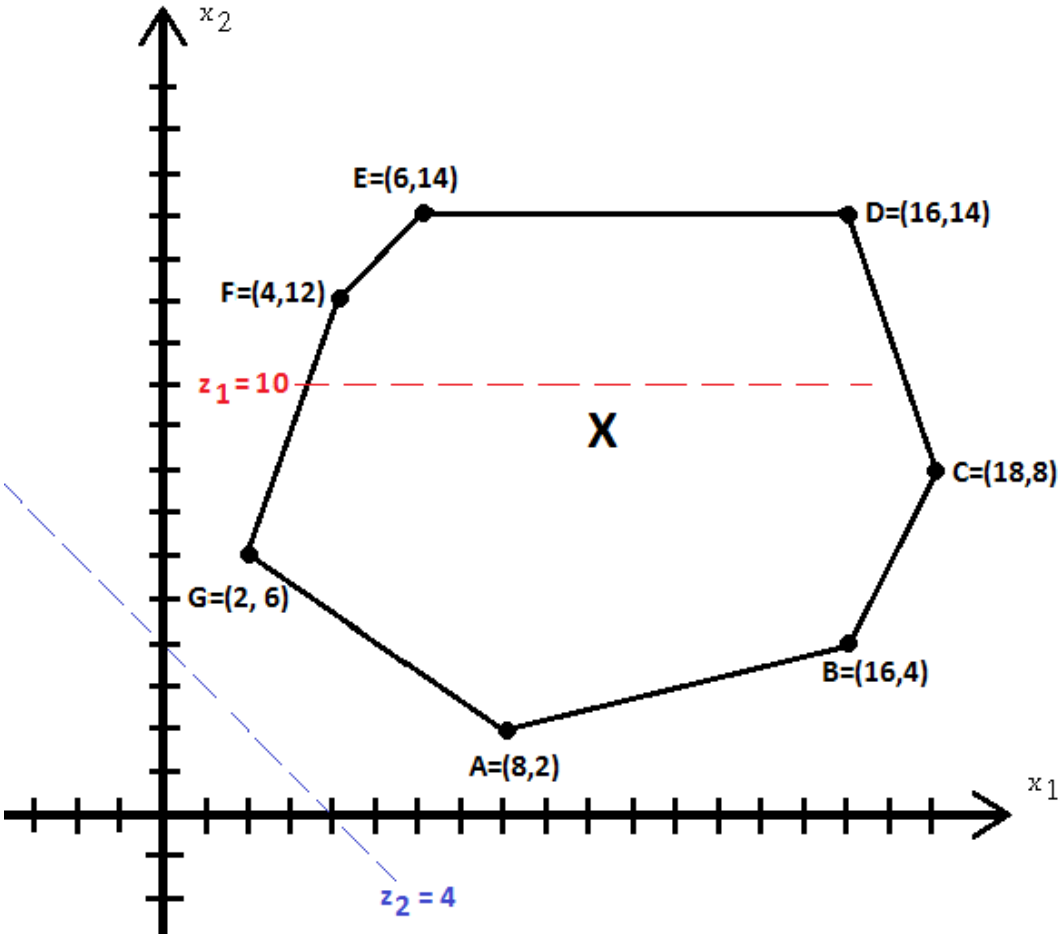
Date: **January 21, 2022** Duration: **1h 30m**

Note: Present all the calculations you carry out, as well as any comments, justifications or conclusions you deem appropriate.

1. *(Predicted quotation: 4,0 values = 2,75 + 1,25)*

Consider the following **linear programming** problem with **two objective functions**:

Maximize $z_1 = x_2$
Minimize $z_2 = x_1 + x_2$
subject to
$\underline{\mathbf{x}} = (x_1, x_2)^T \in X$



a) Determine the **set of strictly (and/or weakly) efficient solutions** using the graphical representation of this problem in the space of decision variables. Justify your answer.

b) Obtain the pay-off table corresponding to this problem and identify the **ideal solution** and the **anti-ideal solution**.

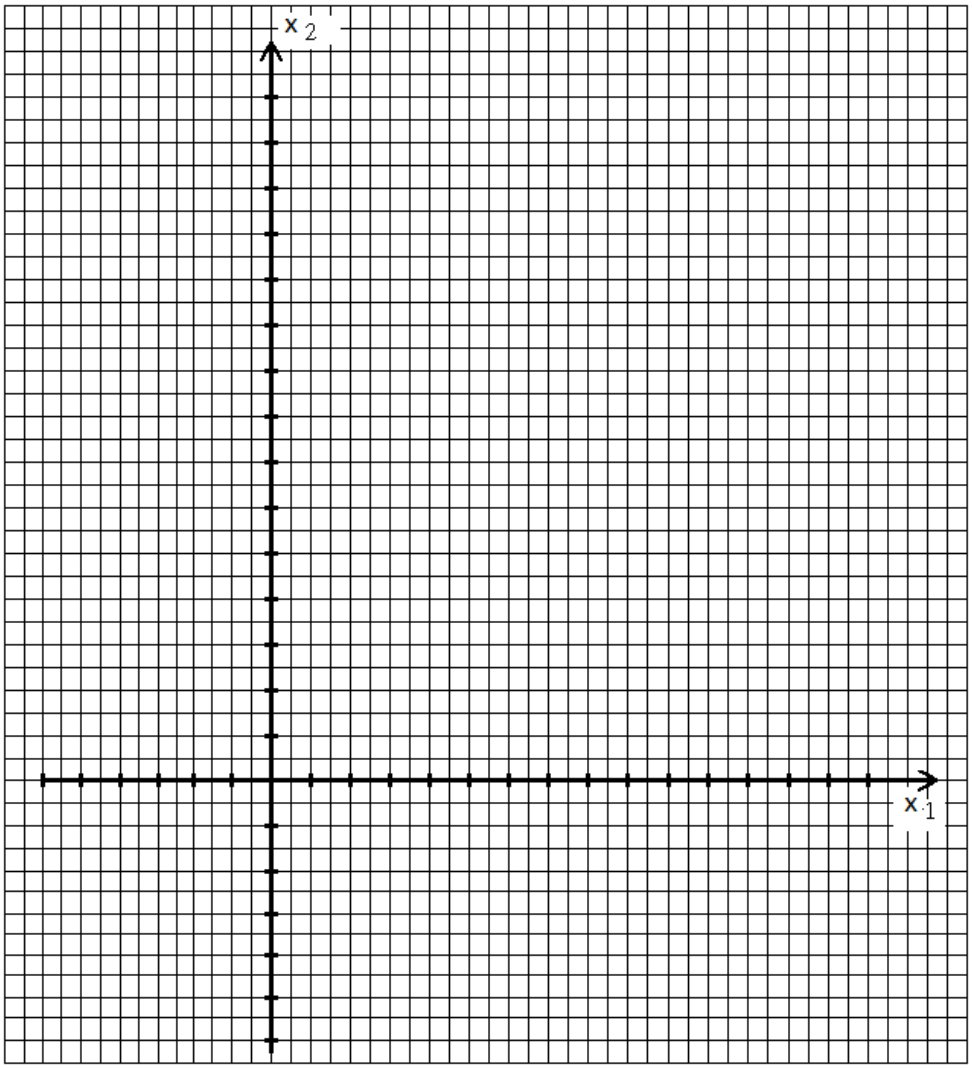
2. *(Predicted quotation: 4,5 values = 2,75 + 1,25 + 0,5)*

Now consider the following **goal programming** problem:

Minimize $Z = \{ d_3^-, d_5^+, d_4^- \}$
subject to

$$-x_1 + 2x_2 + d_1^- = 6 \quad \textbf{(1)}$$
$$x_1 + 2x_2 + d_2^- = 12 \quad \textbf{(2)}$$
$$3x_1 - 2x_2 + d_3^- - d_3^+ = 12 \quad \textbf{(3)}$$
$$x_2 + d_4^- - d_4^+ = 4 \quad \textbf{(4)}$$
$$x_1 + d_5^- - d_5^+ = 8 \quad \textbf{(5)}$$
$$x_1 \geq 0,\ x_2 \geq 0,\ d_i^- \geq 0,\ d_i^+ \geq 0\ (i = 1, 2, 3, 4, 5)$$

a) Solve this problem by **the graphical method**.



b) For **each goal** of the problem, indicate, justifying, what was the intended objective and whether it **was achieved or not**.

c) Comment the following statement: "*Goal programming cannot be considered a multi-objective decision methodology because the only objective is to minimize deviations from goals*".

Name _____ **No.** _____