Domanda **2**

Risposta non ancora data

Punteggio max.: 1,00

Contrassegna domanda

Solve the following problem with the Branch and Bound method. (Hint: You can use the graphical method to identify relaxation solutions).

Report the optimal value of the objective function.

Note: enter the value of the optimal solution in the box below. The various steps that led you to the solution, made on a paper sheet, must be photographed and uploaded later.

$$\begin{aligned} \max \quad & z = 5x_1 + 4x_2 \\ \text{s.t.} \quad & x_1 + x_2 \leq 5 \\ & 10x_1 + 6x_2 \leq 45 \\ & x_1, x_2 \in \mathbb{Z}^+ \end{aligned}$$

Domanda **3**

Risposta non ancora data

Punteggio

In the **branch and bound** algorithm, how are the **LB** and **UB** of each node determined?

Note: You are not required to enter anything in the text box below. The exercise must be carried out with pen and paper and loaded later.

Domanda **4**

Risposta non ancora data

Punteggio max.: 1,00

Contrassegna domanda

Consider the following minimization problem:

$$f(x) = x_1^2 + x_2 + 2x_3 + 2x_1x_2 + x_1x_3 + 4x_2x_3$$

Apply one iteration of the gradient method starting from point A = (-1,0, 2) by performing the line search in an exact way.

Note: enter the value of the solution fund in the box below. The various steps that led you to the solution, made on a paper sheet, must be photographed and uploaded later.

Domanda **5**

Risposta non ancora data

Punteggio max.: 1,00

Contrassegna domanda

A client contacts a bank for a loan of 50 (thousand) euros for one year.

The bank has three alternatives

1. It can grant the loan at a rate of 12%. In this case, there is a 1/25 probability that the client will go bankrupt and the bank will lose the loan;
2. or the bank can invest the same amount in bonds that yield 6% (risk-free);
3. Finally, the bank could investigate the client's credit history at a cost of €500. The past history indicates that :

- P(favorable history | the client returns the sum) = 78/96
- P(favorable history | customer goes bankrupt) = 1/4

(a) Draw the decision tree

(b) How does a bank maximize its expected profit?

Note: enter the value of the solution found (number of the branch) in the box. The various steps that led you to the solution, made on a paper sheet, must be photographed and uploaded later.

Domanda **6**

Risposta non ancora data

Punteggio max.: 1,00

Contrassegna domanda

A company that produces multimedia devices needs to redefine its product range for the coming month.

The company currently produces three different devices, called DX, DY, and DZ.

The three products have unit storage costs of €0.4, €0.3, and €0.25 and unit profits of €50, €30 and €60.

In addition, each device requires a storage space of 8, 4, and 6 cm3 for each of the three models respectively.

In defining the new range, the company believes that no more than 200 pieces of the DX and DY models taken together should be produced and that the number of DY units should not exceed 40% of the total units produced.

In the coming month, the company can invest a maximum of 90 euros in stocking the products and intends to use its own warehouses, which together have a capacity of 2000 cm3.

Finally, the production manager requests that in the coming month the percentage of costs for the storage of the DZ product be between 25% and 75% of the total costs incurred.

Based on the information contained in the attached model and report, please answer the following questions.

```
Maximize 49.6 X + 29.7 Y + 59.75 Z
  Subject to
COND1) 1 X + 1 Y <= 200
COND2) 8 X + 1 Y + 6 Z <= 2000
COND3) 0.4 X - 0.6 Y + 0.4 Z >= 0
COND4) 0.4 X + 0.3 Y + 0.25 Z <= 90
COND5) 0.1 X + 0.075 Y - 0.1875 Z <= 0
COND6) 0.3 X + 0.225 Y - 0.0625 Z >= 0
```

```
    LP OPTIMUM FOUND AT STEP      0

        OBJECTIVE FUNCTION VALUE

        1)      18660.00

   VARIABLE        VALUE          REDUCED COST
          X       30.000000          0.000000
          Y       35.000000          0.000000
          Z      270.000000          0.000000


      ROW   SLACK OR SURPLUS     DUAL PRICES
    COND1)      135.000000          0.000000
    COND2)        0.000000          3.750000
    COND3)       99.000000          0.000000
    COND4)        0.000000        123.999992
    COND5)       45.000000          0.000000
    COND6)        0.000000       -100.000000
```

```
RANGES IN WHICH THE BASIS IS UNCHANGED:

                        OBJ COEFFICIENT RANGES
VARIABLE        CURRENT         ALLOWABLE         ALLOWABLE
                  COEF          INCREASE          DECREASE
       X      49.599998         15.500000         10.000001
       Y      29.700001          7.500000         10.782608
       Z      59.750000          INFINITY         25.000000

                        RIGHTHAND SIDE RANGES
     ROW        CURRENT         ALLOWABLE         ALLOWABLE
                    RHS          INCREASE          DECREASE
   COND1     200.000000          INFINITY        135.000000
   COND2    2000.000000         70.000000         80.000000
   COND3       0.000000         99.000000          INFINITY
   COND4      90.000000          3.750000          3.043478
   COND5       0.000000          INFINITY         45.000000
   COND6       0.000000         17.500000          7.500000
```

(a) The company has the possibility to rent a new space for the next month which would provide 70 cm3 more space. How much should the rent of the space be paid at most for the investment to be convenient? Why?

(b) The production manager wants to understand what effect would limit the production of new DX and DY devices to 150 instead of 200 pieces. What would be the monetary loss for the company in this case?

Note: You are not required to enter anything in the text box below. The exercise must be carried out with pen and paper and loaded later.

Domanda **1**

Risposta non ancora data

Punteggio max.: 1,00

Contrassegna domanda

In a residential area, three shops must be located to meet the demand for a particular product.

Ten potential sites where these new shops can be installed have already been identified.

The installation cost of each of them is known and denoted with c1,...,c10.

The location of the n customers who will frequent the shops is also known, and it is considered that each customer will frequent the nearest open shop.

The cost associated with each customer i is considered to be equal to the distance d_{i,j} to reach shop j.

The objective of the problem is to formulate an ILP problem to find the three shops that need to be opened to minimize the total costs, defined as the sum of the distances that customers have to travel to reach the nearest open shop and the sum of the costs of opening the shops.

Note that the decisions that need to be made in the problem correspond to which of the potential stores will be opened, and for each customer which will be the (open) store they will frequent.

Provide the full formulation of the ILP problem.