Indian Institute of Technology Ropar
Department of Mathematics

MA303: Computing Lab II
2nd semester of academic year 2023-24

Lab Sheet-3
Simplex Method

- Write a code to solve the following problems through the Simplex method.
- Where the input method should be like the (Ask from user)

  1. Enter the number of the variables.
  2. Enter the number of the constraints.
  3. Enter the number of "$\leq$" constraints.
  4. Enter the number of "$=$" constraints.
  5. Enter the number of "$\geq$" constraints.
  6. Enter the constraints chronologically.

  The output should be

  1. Print the initial simplex table.
  2. Print all the tables.
  3. Print the optimal solution.

1. Three grades of coal A, B and C contain phosphorus and ash as impurities. In a particular process, fuel up to 100 ton (maximum) is required which should contain ash not more than 3% and phosphorous not more than 0.03%. It is desired to maximize the profit while satisfying these conditions. There is an unlimited supply of each grade. The percentage of impurities and the profits of grades are given below.

Coal	Phosphorus(%)	Ash (%)	Profits in Rs/ton
A	0.02	3.0	12.00
B	0.04	2.0	15.00
C	0.03	5.0	14.00

   Find the proportions using the Simplex method in which the three grades be used. [**Answer**: (40,40,20) and Z_{max} = Rs.1360]

2. Write a code to check the nature of the solution and solve it, if possible, using the Simplex method.

   (a)

$$\begin{aligned} \text{Maximize} Z &= 2x_1 + x_2 \\ \text{subject to } x_1 - x_2 &\leq 10 \\ 2x_1 - x_2 &\leq 40 \\ x_1, x_2 &\geq 0 \end{aligned}$$

(b)

$$\begin{aligned} \text{Minimize} Z &= -x + 2y \\ \text{subject to } &-x + 3y \leq 10 \\ &x + y \leq 6 \\ &x - y \leq 2 \\ &x, y \geq 0 \end{aligned}$$

$* * * * *$ END $* * * * *$