<u>CA 1</u>

Question:

What is optimization? Define the types of optimization? Minimize the f(x,y)=x^2+y^2+3x+4y+5 using python code?

Optimization is the process of finding the best solution to a problem, typically involving maximizing or minimizing a mathematical function (objective function) subject to certain constraints. In simpler terms, it's about finding the best possible value or set of values for a given problem.

Types of Optimization:

1. **Linear Optimization:** Deals with problems where the objective function and constraints are linear equations.

2. **Nonlinear Optimization:** Handles problems where the objective function or constraints are nonlinear.

3. **Integer Programming:** A type of optimization where the decision variables are restricted to integer values.

4. **Combinatorial Optimization:** Involves finding the best solution from a discrete set of possibilities, often related to combinatorial problems.

5. **Constrained Optimization:** Optimizes a function subject to specified constraints.

6. **Unconstrained Optimization:** Optimizes a function without any constraints.

<u>Source Code:</u>

```
import numpy as np

from scipy.optimize import minimize


# Define the function

def f(x):

    X, Y = x

    return X*2 + Y*2 + 3*X + 4*Y + 5
```

```python
# Initial guess (X=0, Y=0)

initial_guess = [0, 0]


# Use minimize function to find the minimum

result = minimize(f, initial_guess)


# Print the result

print("Optimal values for X and Y:", result.x)

print("Minimum value of the function:", result.fun)
```

Output:

Optimal values for X and Y: [-1.05022526e+08 -1.26027058e+08]

Minimum value of the function: -1281274974.6586776