**Practical No. 13**

**A.1 Aim:**

To solve the using duality theorem.

**A.2 Prerequisite:**

Python, Jupiter notebook, demo in xlsx

**A.3 Outcome:**

The program is written in Python solving using duality.

**A.4 Theory:**

Refer to the theory on this URL: [(8) Economic Interpretation of the Dual LP - YouTube](https://www.youtube.com/watch?v=hMjQK7fV8IE)

PART B

(PART B : TO BE COMPLETED BY STUDENTS)

***(Students must submit the soft copy as per the following segments within four hours of the practical. The soft copy must be uploaded on the portal or emailed to the concerned lab in charge faculties at the end of the practical in case there is no portal access available)***

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| --- | --- |
| Roll. No. DS2201 | Name:abhishek Michael |
| Class | Batch: |
| Date of Experiment:20/02/24 | Date of Submission:21/02/24 |
| Grade: | |

**B.1 Task to do:**

Refer the problem statement mentioned in the following URL and solve it using Python.

[(8) Economic Interpretation of the Dual LP - YouTube](https://www.youtube.com/watch?v=hMjQK7fV8IE)

**B.2 Output program**

**import pulp**

**# Define the primal problem**

**prob = pulp.LpProblem("Primal", pulp.LpMaximize)**

**# Define decision variables**

**x1 = pulp.LpVariable("x1", lowBound=0)**

**x2 = pulp.LpVariable("x2", lowBound=0)**

**# Define objective function**

**prob += 800 \* x1 + 600 \* x2**

**# Define constraints**

**prob += 250 \* x1 + 450 \*x2 <= 9000**

**prob += 250 \*x1 + 50 \* x2 <= 5000**

**# Solve the primal problem**

**prob.solve()**

**# Print the optimal solution**

**print("Optimal Solution of Primal Problem:")**

**print("x1 =", pulp.value(x1))**

**print("x2 =", pulp.value(x2))**

**print("Optimal Objective Value =", pulp.value(prob.objective))**

**# Define the dual problem**

**dual\_prob = pulp.LpProblem("Dual", pulp.LpMinimize)**

**# Define dual variables**

**y1 = pulp.LpVariable("y1", lowBound=0)**

**y2 = pulp.LpVariable("y2", lowBound=0)**

**# Define objective function for dual**

**dual\_prob += 9000 \* y1 + 5000 \* y2**

**# Define constraints for dual**

**dual\_prob += 250 \* y1 +250 \* y2 >= 800**

**dual\_prob += 450 \*y1 + 50 \* y2 >= 600**

**# Solve the dual problem**

**dual\_prob.solve()**

**# Print the optimal solution for the dual problem**

**print("\nOptimal Solution of Dual Problem:")**

**print("y1 =", pulp.value(y1))**

**print("y2 =", pulp.value(y2))**

**print("Optimal Objective Value (Dual) =", pulp.value(dual\_prob.objective))**

**B.4 Conclusion:**

Optimal Solution of Primal Problem:

x1 = 18.0

x2 = 10.0

Optimal Objective Value = 20400.0

Optimal Solution of Dual Problem:

y1 = 1.1

y2 = 2.1

Optimal Objective Value (Dual) = 20400.0