**Problem 1**

1. **Formulate MIP:**
2. **Please refer to the R file “A1\_Problem1.R”**

**Problem 2**

1. **Formulate MIP:**

Indices:

Variables:

Parameters:

(Euclidean distances between the coordinates of facility k and customer l)

(These values were not used, since the threshold of how much each facility can supply was not given)

Formulation:

1. **Please refer to the R file “A1\_Problem2.R”**

**Problem 3**

1. **Formulate MIP (General):**

Indices:

Variables:

Parameters:

Formulation:

1. **Example:**

Indices:

Parameters:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***k\c*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** | ***8*** | ***9*** | ***10*** |
| ***1*** | 8 | 28 | 9 | 23 | 16 | 3 | 13 | 19 | 16 | 23 |
| ***2*** | 17 | 20 | 23 | 8 | 11 | 16 | 2 | 7 | 29 | 4 |
| ***3*** | 14 | 15 | 26 | 9 | 14 | 16 | 16 | 5 | 1 | 3 |
| ***4*** | 17 | 13 | 24 | 24 | 14 | 25 | 11 | 2 | 0 | 0 |

Result:

1. **Please refer to the R file “A1\_Problem3.R”**

**Problem 4**

1. **Formulate TSP:**

Indices:

Variables:

Parameters:

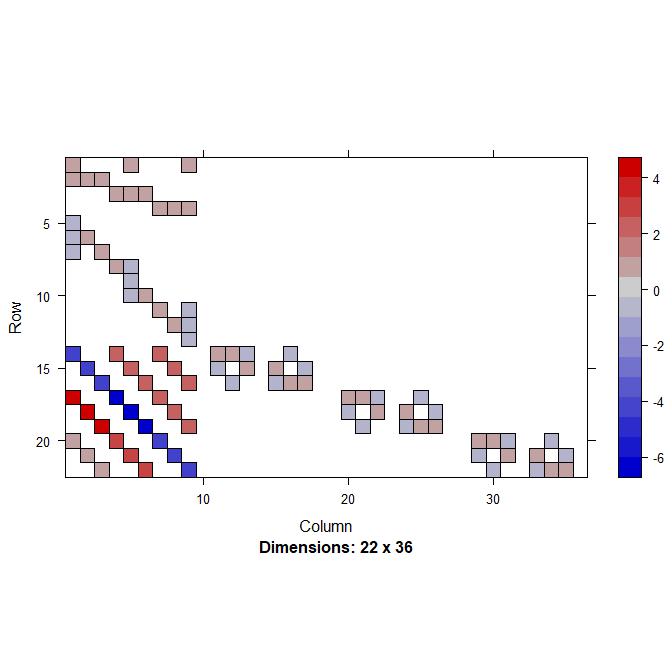
(For Cij where i = j, a big M value of 10,000 was given)

Formulation:

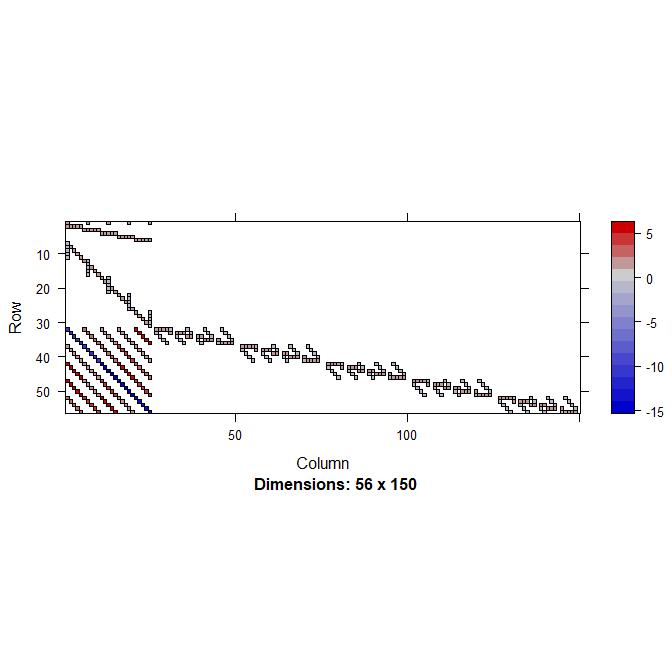
1. **Please refer to the R file “A1\_Problem4.R”**

**Bonus**

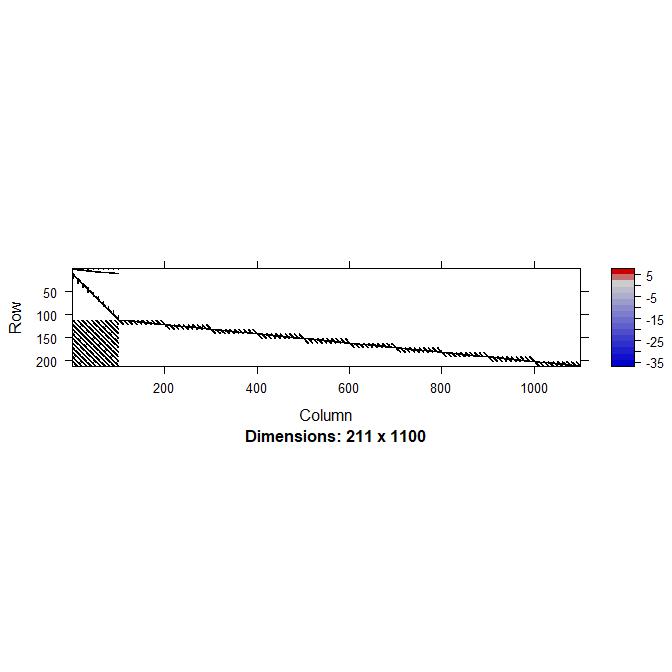
N=3



N=5



N=10



For the R code please refer to the R file “A1\_Bonus.R”