**INDR 363 Homework Assignment 1**

Alper Kılınç 63912

Metehan Gelgi 64178

**9.1.4**

a)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Product 1 | | | Product 2 | | | Product 3 | | | Dummy | | | Supply |
| Plant 1 |  |  | 31 |  |  | 45 |  |  | 38 |  |  | 0 | 400 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Plant 2 |  |  | 29 |  |  | 41 |  |  | 35 |  |  | 0 | 600 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Plant 3 |  |  | 32 |  |  | 46 |  |  | 40 |  |  | 0 | 400 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Plant 4 |  |  | 28 |  |  | 42 |  |  | M |  |  | 0 | 600 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Plant 5 |  |  | 29 |  |  | 43 |  |  | M |  |  | 0 | 1000 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Demand | 600 | | | 1000 | | | 800 | | | 600 | | | 3000 |

subject to

b) PYOMO

**9.1.6**

a)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Customer 1 | | | Customer 2 | | | Customer 3 | | | Customer 4 | | | Supply |
| Plant 1 |  |  | 800 |  |  | 700 |  |  | 500 |  |  | 200 | 60 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Plant 2 |  |  | 500 |  |  | 200 |  |  | 100 |  |  | 300 | 80 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Plant 3 |  |  | 600 |  |  | 400 |  |  | 300 |  |  | 500 | 40 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| At Least | 40 | | | 60 | | | 20 | | | 0 | | |  |
| Requested | 40 | | | 60 | | | ∞ | | | ∞ | | |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Customer 1 | | | Customer 2 | | | Customer 3 | | | Max (C3, C4) | | | Supply |
| Plant 1 |  |  | 800 |  |  | 700 |  |  | 500 |  |  | 200 | 60 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Plant 2 |  |  | 500 |  |  | 200 |  |  | 100 |  |  | 300 | 80 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Plant 3 |  |  | 600 |  |  | 400 |  |  | 300 |  |  | 500 | 40 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Demand | 40 | | | 60 | | | 20 | | | 60 | | |  |

Demand constraints:

Supply constraints

aa)

Demand constraints:

Supply constraints

b)

Maximizing transportation can be converted to minimizing by sign of coefficients.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Customer 1 | | | Customer 2 | | | Customer 3 | | | Max (C3, C4) | | | Supply |
| Plant 1 |  |  | -800 |  |  | -700 |  |  | -500 |  |  | -200 | 60 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Plant 2 |  |  | -500 |  |  | -200 |  |  | -100 |  |  | -300 | 80 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Plant 3 |  |  | -600 |  |  | -400 |  |  | -300 |  |  | -500 | 40 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Demand | 40 | | | 60 | | | 20 | | | 60 | | |  |

Demand constraints:

Supply constraints

bb)

Demand constraints:

Supply constraints

**9.1.9**

a)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Supply | | | Product 1 | | | | | | | | | Product 2 | | | | | | | | |
| Month 1 | | | Month 2 | | | Month 3 | | | Month 1 | | | Month 2 | | | Month 3 | | |
| Product 1 | Month 1 | RT |  |  | 15 |  |  | 16 |  |  | 18 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| OT |  |  | 18 |  |  | 19 |  |  | 20 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Month 2 | RT |  |  |  |  |  | 17 |  |  | 19 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| OT |  |  |  |  |  | 20 |  |  | 22 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Month 3 | RT |  |  |  |  |  |  |  |  | 19 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| OT |  |  |  |  |  |  |  |  | 22 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Product 2 | Month 1 | RT |  |  |  |  |  |  |  |  |  |  |  | 16 |  |  | 18 |  |  | 19 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| OT |  |  |  |  |  |  |  |  |  |  |  | 20 |  |  | 22 |  |  | 23 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Month 2 | RT |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 15 |  |  | 16 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| OT |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 18 |  |  | 19 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Month 3 | RT |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 17 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| OT |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 22 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Net Demand | | | 5 | | | 3 | | | 4 | | | 3 | | | 5 | | | 4 | | |

b) PYOMO