List of tables

**OPTIMIZATION MODEL FOR MULTI-PRODUCT MULTI-PERIOD MULTI-SUPPLIER RAW-MATERIAL SELECTION AND COMPOSITION, AND ORDER QUANTITY PROBLEM WITH MINUMUM ONE-YEAR ORDER QUANTITY CONTRACT**

Table 1 the flexibility matrix of items 1 – 17.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **item** | **raw material** | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** |
| 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 0 | 1 | 0 | 0 |
| 6 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 0 | 1 | 0 | 0 |
| 10 | 1 | 1 | 0 | 1 | 0 | 0 |
| 11 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 1 | 0 | 0 | 1 | 0 | 0 |
| 16 | 1 | 0 | 0 | 1 | 0 | 0 |
| 17 | 1 | 1 | 1 | 1 | 1 | 1 |

Table 2 The flexibility matrix of items 18 - 34

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **item** | **raw material** | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 0 | 1 | 0 | 0 |
| 21 | 1 | 1 | 0 | 1 | 0 | 0 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 |
| 23 | 1 | 1 | 1 | 1 | 1 | 1 |
| 24 | 1 | 1 | 1 | 1 | 1 | 1 |
| 25 | 1 | 1 | 1 | 1 | 1 | 1 |
| 26 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 |
| 28 | 1 | 1 | 1 | 1 | 1 | 1 |
| 29 | 1 | 1 | 1 | 1 | 1 | 1 |
| 30 | 1 | 1 | 1 | 1 | 1 | 1 |
| 31 | 1 | 1 | 1 | 1 | 1 | 1 |
| 32 | 1 | 1 | 1 | 1 | 1 | 1 |
| 33 | 1 | 1 | 1 | 1 | 1 | 1 |
| 34 | 1 | 1 | 1 | 1 | 1 | 1 |

Table 3 the flexibility matrix of items 35 – 51.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **item** | **raw material** | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** |
| 35 | 1 | 1 | 0 | 1 | 0 | 1 |
| 36 | 1 | 1 | 1 | 1 | 1 | 1 |
| 37 | 1 | 1 | 1 | 1 | 1 | 1 |
| 38 | 1 | 1 | 1 | 1 | 1 | 1 |
| 39 | 1 | 1 | 1 | 1 | 1 | 1 |
| 40 | 1 | 1 | 1 | 1 | 1 | 1 |
| 41 | 1 | 1 | 0 | 1 | 0 | 0 |
| 42 | 1 | 1 | 0 | 1 | 0 | 0 |
| 43 | 1 | 1 | 1 | 1 | 0 | 1 |
| 44 | 1 | 1 | 0 | 1 | 0 | 0 |
| 45 | 1 | 1 | 0 | 1 | 0 | 0 |
| 46 | 1 | 1 | 0 | 1 | 0 | 1 |
| 47 | 1 | 1 | 1 | 1 | 1 | 1 |
| 48 | 1 | 1 | 1 | 1 | 1 | 1 |
| 49 | 0 | 0 | 0 | 1 | 0 | 0 |
| 50 | 0 | 0 | 0 | 1 | 0 | 0 |
| 51 | 1 | 1 | 0 | 1 | 0 | 0 |

Table 4 demand for items 1 - 17

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **item** | **raw -material demand (in kg)** | | | |
| **week 1** | **week 2** | **week 3** | **week 4** |
| 1 | 2,555.1 | 2,555.1 | 0 | 10,220.4 |
| 2 | 0 | 4,300 | 8,600 | 0 |
| 3 | 0 | 0 | 0 | 1,800 |
| 4 | 0 | 495 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 |
| 6 | 3,150 | 0 | 6,300 | 0 |
| 7 | 0 | 1,050 | 0 | 350 |
| 8 | 1,650 | 0 | 0 | 2,200 |
| 9 | 2,080 | 1,560 | 1,040 | 0 |
| 10 | 0 | 1,280 | 0 | 0 |
| 11 | 0 | 0 | 4,200 | 0 |
| 12 | 0 | 2,700 | 0 | 0 |
| 13 | 350 | 350 | 0 | 0 |
| 14 | 0 | 300 | 500 | 200 |
| 15 | 85 | 0 | 0 | 0 |
| 16 | 110 | 165 | 0 | 0 |
| 17 | 0 | 0 | 17,400 | 17,400 |

Table 5 demand for items 18 – 34

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **item** | **raw -material demand (in kg)** | | | |
| **week 1** | **week 2** | **week 3** | **week 4** |
| 18 | 74,050 | 222,150 | 14,800 | 0 |
| 19 | 0 | 11,605 | 0 | 0 |
| 20 | 12,750 | 0 | 0 | 0 |
| 21 | 3,500 | 0 | 14,000 | 14,000 |
| 22 | 42,100 | 0 | 10,550 | 0 |
| 23 | 0 | 0 | 5,600 | 11,200 |
| 24 | 5,400 | 5,400 | 0 | 5,400 |
| 25 | 1,350 | 2,250 | 0 | 0 |
| 26 | 0 | 32,400 | 43,200 | 0 |
| 27 | 10,350 | 31,050 | 0 | 0 |
| 28 | 118,200 | 0 | 0 | 0 |
| 29 | 3,330 | 4,995 | 0 | 0 |
| 30 | 0 | 1,950 | 0 | 5,850 |
| 31 | 0 | 6,300 | 6,300 | 0 |
| 32 | 2,310 | 3,465 | 0 | 0 |
| 33 | 0 | 2,500 | 0 | 0 |
| 34 | 0 | 0 | 20,850 | 0 |

Table 6 Demand for items 35 - 51

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **item** | **raw -material demand (in kg)** | | | |
| **week 1** | **week 2** | **week 3** | **week 4** |
| 35 | 12,150 | 0 | 0 | 0 |
| 36 | 0 | 0 | 0 | 0 |
| 37 | 12,750 | 12,750 | 8,500 | 8,500 |
| 38 | 1,550 | 3,100 | 0 | 0 |
| 39 | 0 | 10,600 | 5,300 | 21,200 |
| 40 | 0 | 0 | 10,450 | 20,900 |
| 41 | 9,625 | 0 | 1,375 | 1,375 |
| 42 | 0 | 0 | 3,080 | 0 |
| 43 | 0 | 2,250 | 450 | 2,250 |
| 44 | 0 | 0 | 14,100 | 0 |
| 45 | 6,700 | 13,400 | 10,050 | 6,700 |
| 46 | 6,500 | 13,000 | 0 | 0 |
| 47 | 26,200 | 13,100 | 0 | 0 |
| 48 | 12,000 | 8,000 | 0 | 12,000 |
| 49 | 0 | 126 | 0 | 0 |
| 50 | 1,323 | 0 | 3,969 | 0 |
| 51 | 1,170 | 1,170 | 0 | 780 |

Table 7 the other parameters’ values

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **raw material** | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** |
| price | 16.54639 | 15.50 | 18.11 | 14.72 | 19.80 | 15.19 |
| (in kg) | 15,000 | 10,000 | 11,500 | 9,000 | 8,000 | 12,500 |
| (in kg) | 3,250 | 2,850 | 3,300 | 2,500 | 3,500 | 3,050 |
| (in kg) | 7,956,000 | 19,944,000 | 648,000 | 2,952,000 | 288,000 | 4,212,000 |
| (in kg) | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 |
| *maxcap*  (in kg) | 1,427,000 | | | | | |

Table 8 Total order quantity and weekly deliveries

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Raw material | Order quantity  (in kg) | Week 1 delivery (in kg) | Week 2 delivery (in kg) | Week 3 delivery (in kg) | Week 4 delivery (in kg) |
| 1 | 192,649 | 6,552.583 | 65,295 | 81,722 | 39,079 |
| 2 | 543,385 | 354,839.300 | 23,595 | 96,122 | 68,829 |
| 3 | 90,742 | 41,091.667 | 26,550 | 14,400 | 8,700 |
| 4 | 56,508 | 33,264.050 | 209 | 18,369 | 4,666 |
| 5 | 52,958 | 42,607.500 | 10,350 | 0 | 0 |
| 6 | 202,853 | 70,727.500 | 111,075 | 0 | 21,050 |
| Total | 1,139,094 | 6,552.583 | 65,295 | 81,722 | 39,079 |

Table 9 The values of  for and 

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **item** | **week** | **Raw material** | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** |
| 45 | 1 | 0 | 0,5 | 0 | 0,5 | 0 | 0 |
| 45 | 2 | 0,5 | 0,5 | 0 | 0 | 0 | 0 |
| 45 | 3 | 0,5 | 0,5 | 0 | 0 | 0 | 0 |
| 45 | 4 | 0,5 | 0,5 | 0 | 0 | 0 | 0 |
| 46 | 1 | 0,333 | 0,333 | 0 | 0,333 | 0 | 0 |
| 46 | 2 | 0,5 | 0,5 | 0 | 0 | 0 | 0 |
| 46 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| 46 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 10 The values of  for and 

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **item** | **week** | **Raw material** | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** |
| 49 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 49 | 2 | 0 | 0 | 0 | 1 | 0 | 0 |
| 49 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| 49 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 50 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50 | 3 | 0 | 0 | 0 | 1 | 0 | 0 |
| 50 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 11 The fulfillment of the safety stock constraint and the maximum capacity constraint (set of Constraints VII and VIII)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Raw material | End of week 1 (in kg) | End of week 2 (in kg) | End of week 3 (in kg) | End of week 4 (in kg) |
| 1 | 2,501 | 2,501 | 2,500 | 2,500 |
| 2 | 181,743 | 2,501 | 2,500 | 2,500 |
| 3 | 2,500 | 2,500 | 2,500 | 2,500 |
| 4 | 2,500 | 2,501 | 2,501 | 2,500 |
| 5 | 2,500 | 2,500 | 2,500 | 2,500 |
| 6 | 2,500 | 2,500 | 2,500 | 2,500 |