Problem 1:

Results:

Table

Description automatically generated

Explanation:

The V table represents the Megawatts produced by each generator in each period. The G table represents a Boolean describing whether a generator should be run in each period, using the “Big M” method to ensure the code has reason to change these variables.

We can see that it is optimal to run both generators 1 and 2 in each period, which makes sense because this helps avoid paying start up costs in period 2. Generator 1 produces 1100 and 2100 megawatts in periods 1 and 2 respectively. Generator 2 produces 1800 megawatts in both periods 1 and 2. Generator 3 is not run. This totals a cost of 38,400.

Problem 2:

a)

Results:

Table

Description automatically generated with low confidence

Explanation:

The STORE table represents how many tons of each product are in each silo. For example, row S1 column A has a value of 25 – so there are 25 tons of product A in silo 1. Each row only has 1 non-zero value because we were constrained to a single product per silo. The BOOL table is just a table showing whether or not a product is in a given silo, 1’s representing it is, 0’s represnting it’s not. Resulting in a minimum cost of 290.

2b)

In our “.mod” file have now added the amount of wasted space (cap – amount stored) to our objective function along with two coefficients representing the “weight” of each objective (total cost and empty space). We can then use the weighted sum approach to solve for the optimal solution based on the given weights. Note: With the small weights used fort the waste we still get the same optimal solution.

Problem 3:

Result:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Demand | WII | WRS | WE | WU | WOW | Cost |
| 5000 | 0 | 5000 | 0 | 0 | 0 | $20500 |
| 10000 | 0 | 10000 | 0 | 0 | 0 | $43000 |
| 25000 | 4000 | 14000 | 7000 | 0 | 0 | $99650 |
| 35000 | 0 | 14000 | 6000 | 15000 | 0 | $139650 |
| 45000 | 0 | 14000 | 6000 | 0 | 25000 | $177800 |
| 50000 | 4000 | 14000 | 7000 | 0 | 25000 | $201550 |
| 55000 | 0 | 14000 | 1000 | 15000 | 25000 | $221800 |

Explanation: Above shows the optimal order amounts for each corresponding Widget demand along with the resulting costs. Again using a Boolean table and a few extra variables to make sure all given constraints were met (see .mod comments).