Exercise: 1/2/D/D with capacity constraints and orders synchronization

A company produces and sells two types of a product, called A and B. The estimated demand is 180 units/weeks for A and 300 units/week for B. The unit cost for producing A is 800 €; for B it is 500 €. The components that are needed for the production are supplied independently for A and B but the supply cost is 5000 € in both cases. The components are stocked in a warehouse before being used. The obsolescence rate of the components is 20% of their value in one year (1 year = 52 weeks). No stock-out is allowed because it would block the production.

Classify the inventory system.

Determine the optimal amounts of components to transport for each order and the optimal period of the supply.

Compute the total minimum cost.

Consider the following variation: the components needed to produce a unit of A require 0.4 square meters in the warehouse; those needed to produce a unit of B require 0.2 square meters. If the warehouse has an available area of 500 square meters, re-compute the optimal order quantities and the optimal periods and evaluate the cost increase in comparison with the case with no capacity constraints.

Consider the option of synchronizing the orders of the two products; a joint order would cost 9000 €. Optimize the system exploiting this option, with and without the constraint on the available area.