

## Sheet 6 (Multi-Item Inventory Control)

### Exercise 1:

A manufacturer produces ten products on one machine. No other products are assigned to this equipment. The data for the items are given in the following table.

Item	1	2	3	4	5	6	7	8	9	10
<b>Demand rate (units/year)</b>	200	50	800	500	20	600	100	1000	80	450
<b>Production rate (units/year)</b>	5000	2000	4000	6400	300	36000	2000	6000	900	7250
<b>Setup time <math>\times 10^{-4}</math> (years)</b>	5	6	8	4	1	2	1	6	2	1
<b>Setup cost (€)</b>	75	120	110	60	200	150	80	300	115	95
<b>Holding cost (€/year)</b>	8	14	5	2	25	3	6	20	15	3

- a) Determine the independent optimal production lot-sizes.
- b) Determine the production policy for the common cycle approach.
- c) Use the basic period approach to find a solution.

### Exercise 2:

Consider two products with constant demand rate of  $d_1 = 200$  and  $d_2 = 250$  units per period which are stored in a warehouse with a total capacity of 300 units. The products require  $a_1 = 3$  and  $a_2 = 1$  units of warehouse space. The ordering costs are  $A_1 = 150\text{€}$  and  $A_2 = 111\text{€}$ . Additionally the products cause holding costs of  $h_1 = 1\text{€}$  per unit per period and  $h_2 = 2\text{€}$  per unit per period.

- a) Determine the optimal order quantities using the strategy of dedicated space.
- b) How much would you be willing to pay to obtain additional warehouse space of 700 units?
- c) Use the common-cycle method to determine the optimal replenishment cycle for all products.
- d) Use the results in c) to determine how many units of product 1 are in stock when you replenish product 2.

**Exercise 3:**

Ten products are ordered by a distributor from a single supplier. The specific product data are given in the following table and the following general information has been gathered. The major ordering cost is  $A_0 = 30\text{€}$  and the minor ordering cost for each product is  $A_i = 15\text{€}$ . The delivery lead time is one week.

Product	Monthly demand (units)	Holding cost (€)
1	8	1
2	25	2
3	4	0.6
4	63	5.2
5	67	1.6
6	46	0.4
7	54	0.098
8	2	12
9	83	2
10	82	1

- Find the optimal order frequencies for each product.
- What are the corresponding overall costs?