

IE375 Spring 2000 Mini Homework II - Due: April 9, 2020 Due-time: 17:00

- **Mini Homework II is 2%.** The first question weighs 70% and the second 30%. Make sure that you review course material before you start. Cite sources used if any.
- **Academic Dishonesty (taken from IE375 Course Information):** Academic misconduct is not tolerated, and violations will be treated in accordance with the University policy. For assignments: Discussion of the course material and working in groups are effective ways of learning. However, this does not mean that you can copy the assignment from one of your friends. You can discuss with your friends, but you should be alone, without any written solution in front of you, when you actually prepare your assignment. It is extremely important to understand the value of this exercise in the process of learning. Any violation of the above understanding will result measures outlined in the student rules and regulations.
- **Submission Information:** Please send your solution as a pdf file to IE375 Course TA Emin Özyoruk.
- **More Information on Question: What is expected? How to study?**
- To answer the questions, make sure that you understand the material presented during the course, as well as the reading material from the textbook. Question 1 is related to standard EOQ, Rotation Cycle policy and analysis of different cost assumptions to select the best. Question two requires you to derive an objective function (similar to EOQ, you need to write areas, etc. for the backorder case mentioned in the lecture on Tuesday April 7) and comparison of two functions algebraically.
- Make sure that you understand the problems, and only present your answer accordingly.
- **One final remark:** In the exams, please get used to receiving question types that you have not seen before. One useful purpose of homework and exercises is to cover the “routine” so that you can go beyond that during the exams, and elsewhere.

Question 1

Lenovo uses two different types of processors for its laptops: single-core and dual-core. Lenovo sources these processors from three different suppliers. Demands for processors, purchase costs, and fixed ordering costs are as follows:

Processor type	Demand (units/day)	Purchase cost (\$/unit)	Fixed ordering cost (\$)
Single-core	500	80	10000
Dual-core	1000	100	12000

The inventory holding cost per unit per year is assumed to be 20% of the unit purchase cost for all processor types. Assume 365 days in a year.

- (a) Answer the following
 - i. What is the optimal order quantity for each processor type?
 - ii. What is the optimal total annual cost (inventory holding costs plus purchase costs plus fixed ordering costs) for each processor type?
- (b) Supplier of the dual-core processor makes the following offer: Lenovo can order both processor types for a fixed ordering cost of 12000, of course if both processors are ordered at the same time. However purchase cost per unit for the single-core processor will increase to 81\$/unit.
 - i. What is the optimal order quantity for each processor type?
 - ii. What is the optimal total annual cost in this case?
 - iii. Do you think that Lenovo should accept this offer?

Question 2

Consider the extension of EOQ which allowed for backorders. As an additional parameter to the lot-size, Q , we solve for b , where b is defined as the maximum number of backorders allowed. We also define p as the cost of backorders/unit/unit time. With the purchase cost per year being equal to a constant, we exclude that from the objective function.

- a) Formulate the problem by writing the average total costs (see lecture notes)
- b) One can take the partial derivative of the average total cost function with respect to Q and b ; equate these derivatives to 0 (first-order conditions for optimality; obtain two equations to solve for unknowns and obtain the following result, (as given in the lecture notes)

$$b^* = \{h/(p+h)\} Q^* \text{ and } Q^* = \{(2K\lambda/h)^*[(p+h)/h]\}^{1/2}$$

Using these results, plug those into the average total cost function you have formulated in Part a) and show that it is always less than the average total cost function obtained by EOQ with no backorders

$$\text{Recall: Average Total Cost (EOQ with no backorders)} = \{2K\lambda h\}^{1/2}$$