HOMEWORK 6

PRODUCTION PLANNING & SCHEDULING NICK MORRIS

Problem 22

A.

The source that should be used to order silicon wafers is Source A because it is the only source with an optimal economic order quantity that meets its minimum order quantity. Source B and Source C are infeasible suppliers due to their minimum order quantities being higher than their corresponding economic order quantity. Table 1 below shows the optimal economic order quantities for each supplier, red indicates infeasible quantities and green indicates feasible quantities.

Table 1: Silicon Wafer EOQ – Supplier Comparison 1

Metric	Value	Units
Q* C_A	2,828	[unit/order]
Q* C_B	2,887	[unit/order]
Q* C_C	2,949	[unit/order]

В.

The optimal values of holding and set up costs for silicon wafers when the optimal Source A is used, are given below in row 1 and row 2 of Table 2 respectively.

Table 2: Silicon Wafer Holding and Setup Annual Costs

Metric	Value	Units
H(Q*)	707.11	[\$/year]
K(Q*)	707.11	[\$/year]

C.

The reorder point given a 3 month replenishment lead time is shown in the last row of Table 3 below.

Table 3: Silicon Wafer Reorder Point – On-Hand Inventory

Metric	Value	Units
tau	0.25	[year/order]
T*	0.1414	[year/order]
R	2,172	[unit]

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Problem 23

The supplier that should be used to order silicon wafers is Source B with an economic order quantity in the third row of Table 4 below. The last row of Table 4 shows that Source B at an economic order quantity of 9,428 units per order results in the most cost-effective expected total annual cost.

Table 4: Silicon	Wafer	EOQ -	Supplier	Comparison 2
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	Metric	Value	Units
	Q* C_A	2,828	[unit/order]
	Q* C_B1	2,801	[unit/order]
	Q* C_B2	9,428	[unit/order]
	$G(Q* C_A)$	51,414	[\$/year]
	$G(Q* C_B1)$	52,428	[\$/year]
	G(Q* C*_B2)	49,333	[\$/year]

Problem 24

The optimal order quantity is 925 units per order. This is known because the only difference among the three given order quantities is their all-unit cost. Therefore the ratio between their unit costs can be derived as followed:

$$IF \quad Q_k = \sqrt{\frac{2*K*\lambda}{i*c_k}} \quad AND \quad Q_j = \sqrt{\frac{2*K*\lambda}{i*c_j}} \quad THEN \quad \frac{Q_j^2}{Q_k^2} = \frac{c_j}{c_k}$$

The unknown values for **K**, **lam**, and **i** can be anything because they're constant across the comparison of the order quantities. The unknown values for the three unit costs can be anything given that **C_2** is 0.84 of the value of **C_1**, and **C_3** is 0.75 of the value of **C_1**. The chosen values for this example are given in Table 5 below in blue. The optimal order quantity is 925 because it results in the most cost-effective total annual cost as shown below in the last row of Table 5.

Table 5: All-Units Discount Example

Metric	Value	Units
Q* C_1	800	[unit/order]
Q* C_2	875	[unit/order]
Q* C_3	925	<pre>[unit/order]</pre>
K	50	[\$/order]
lam	2,500	[unit/year]
i	10%	[annual]
C_1	1	[\$/unit]
C_2	0.84	[\$/unit]
C_3	0.75	[\$/unit]
G(Q* C_2)	2,269.22	[\$/year]
G(Q* C_3)	2,039.71	[\$/year]

Homework 6 2

Problem 35

The supplier that should be used to order glyceride is Supplier A at an economic order quantity of 867 units per order. The second to last row of Table 6 shows that Supplier A at an economic order quantity of 867 units per order results in the most cost-effective expected total annual cost.

Table 6: Glyceride EOQ – Supplier Comparison

Metric	Value	Units
Q* C_A1	902	[unit/order]
Q* C_A2	867	[unit/order]
Q* C_A3	830	[unit/order]
Q* C_B1	708	[unit/order]
Q* C_B2	1,074	[unit/order]
G(Q* C*_A2)	778.68	[\$/year]
G(Q* C*_B2)	779.39	[\$/year]

Homework 6

A.

The optimal economic manufacturing policy for Acme Gear Cutters Inc. is given below in Table 7.

Table 7: Acme Gear Cutters Inc. EMQ Policy 1

Metric	Value	Units
Q*	24,495	[unit/order]
T*	1.22	[month/order]

В.

The reorder point for Acme Gear Cutters Inc. given that the replenishment lead-time is 1 month, is shown below in the last row of Table 8.

Table 8: Acme Gear Cutters Inc. Reorder Point

Metric	Value	Units
tau	1	[month/order]
R	20,000	[unit]

C.

The economic manufacturing policy for Acme Gear Cutters Inc., given that there is a capacity constraint of 20,000 units, is shown below in Table 9.

Table 9: Acme Gear Cutters Inc. EMQ Policy 2

Metric	Value	Units
Q* Capacity	20,000	[unit/order]
T* Capacity	1	[month/order]

D.

The optimal production quantity for Acme Gear Cutters Inc. given an All Units Economies of Scale policy and a capacity constraint of 20,000 units, is shown below in the last row of Table 10. There is no change in quantity because of the capacity constraint violations.

Table 10: Acme Gear Cutters Inc. EMO – All Units Discount

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Metric	Value	Units
Q* C_1	24,495	[unit/run]
Q* C_2	24,914	[unit/run]
Q* Capacity	20,000	[unit/run]

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