**IE 7200 Supply Chain Engineering**

**Homework No. 3**

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**Problem 1.** An item is manufactured in batches within a manufacturing facility and the following data is applicable:

|  |  |
| --- | --- |
| D=Consumption rate: | 500 items/ month |
| A=Production rate: | 1500 items/ month |
| W=Storage costs (based on average inventory): | $10 per unit-year = .833 per month |
| I=Interest charges: | $5 per unit-year =0.41666 per month |
| P=Setup charges per batch: | $200 |

The batch is produced so that it is completed exactly when the previous batch is depleted. Determine the EMQ value and associated inventory costs per unit.

**Answer:**

Single products case:

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Inventory cost per unit = 300 \* 0.8333\*0.4166 = **104.123 $**

**Problem 2.** For the item given in the previous problem, assume that the batch is to be completed 0.2 month before the previous batch is depleted. Determine the EMQ value and the associated inventory costs per unit.

**Answer:**

TA= 0.2 months

Consumption rate \* TA= 500 \* .2 = 100 units

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Inventory cost per unit = (300 \* 0.8333\*0.4166) + (100 \* 0.83 \*0.416) = **138.824 $**

**Problem 4.**

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| **End item 1, Level 0** | | | | |
| **Lead time: 1**  **Lot size: EOQ** | | **Period** | | | | | | | |
| **1** | | **2** | **3** | **4** | **5** | | **6** |
|  | |  |  |  |  | |  |
| **Demand** | | **40** | | **20** | **10** | **60** | **10** | | **30** |
| **Receipts** | |  | |  |  | 119 |  | |  |
| **On hand** | **80** | 40 | | 20 | 10 | 69 | 59 | | 29 |
| **Order** | |  | |  | 119 |  |  | |  |

D (average) =

EOQ= =

Total on hand periods: 40+20+10+69+59+29=227

Total Cost: (1\*25) + (.1\*227) = 47.7$

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| **End item 2, Level 0** | | | | |
| **Lead time: 1**  **Lot size: POQ** | | **Period** | | | | | | | |
| **1** | | **2** | **3** | **4** | **5** | | **6** |
|  | |  |  |  |  | |  |
| **Demand** | | **20** | | **10** | **30** | **50** | **70** | | **40** |
| **Receipts** | |  | |  | 180 |  |  | |  |
| **On hand** | **40** | 20 | | 10 | 160 | 110 | 40 | | 0 |
| **Order** | |  | | 180 |  |  |  | |  |

D(average) =

EOQ= =

POQ=

Total on hand periods: 20+10+30+50+70+40=220

Total Cost: (1\*25) + (.1\*340) = 59$

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| **End item D, Level 1** | | | | |
| **Lead time: 1**  **Lot size: LFL** | | **Period** | | | | | | | |
| **1** | | **2** | **3** | **4** | **5** | | **6** |
|  | |  |  |  |  | |  |
| **Demand** | | 0 | | 0 | 119 | 0 | 0 | | 0 |
| **Receipts** | |  | |  | 19 |  |  | |  |
| **On hand** | **100** | 100 | | 100 | 0 | 0 | 0 | | 0 |
| **Order** | |  | | 19 |  |  |  | |  |

Total Cost: (1\*25) + (.1\*200)= 45$

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| **End item A, Level 1** | | | | |
| **Lead time: 1**  **Lot size: PPB** | | **Period** | | | | | | | |
| **1** | | **2** | **3** | **4** | **5** | | **6** |
|  | |  |  |  |  | |  |
| **Demand** | | 0 | | 180 | 0 | 0 | 0 | | 0 |
| **Receipts** | |  | | 150 |  |  |  | |  |
| **On hand** | **30** | 30 | | 0 | 0 | 0 | 0 | | 0 |
| **Order** | | 150 | |  |  |  |  | |  |

Total Cost: (1\*25) + (.1\*30)= 28$

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| **End item B, Level 2** | | | | |
| **Lead time: 1**  **Lot size: LFL** | | **Period** | | | | | | | |
| **1** | | **2** | **3** | **4** | **5** | | **6** |
|  | |  |  |  |  | |  |
| **Demand** | | 150 | | 199 | 119 | 10 | 0 | | 0 |
| **Receipts** | |  | | 249 | 119 | 10 |  | |  |
| **On hand** | **100** | -50 | | 0 | 0 | 0 | 0 | | 0 |
| **Order** | | 249 | | 119 | 10 |  |  | |  |

Total Cost: (3\*25) + (.1\*-50)= 25$

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| **End item CC, Level 2** | | | | |
| **Lead time: 1**  **Lot size: LFL** | | **Period** | | | | | | | |
| **1** | | **2** | **3** | **4** | **5** | | **6** |
|  | |  |  |  |  | |  |
| **Demand** | | 450 | | 0 | 238 | 0 | 0 | | 0 |
| **Receipts** | |  | |  | 188 |  |  | |  |
| **On hand** | **500** | 50 | | 50 | 0 | 0 | 0 | | 0 |
| **Order** | |  | | 188 |  |  |  | |  |

Total Cost: (1\*25) + (.1\*100) = 35$

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| **End item C, Level 3** | | | | |
| **Lead time: 1**  **Lot size: LFL** | | **Period** | | | | | | | |
| **1** | | **2** | **3** | **4** | **5** | | **6** |
|  | |  |  |  |  | |  |
| **Demand** | | 249 | | 318 | 10 | 0 | 0 | | 10 |
| **Receipts** | |  | | 467 | 10 |  | 10 | |  |
| **On hand** | **100** | -149 | | 0 | 0 | 0 | 0 | | 0 |
| **Order** | | 467 | | 10 |  |  | 10 | |  |

Total Cost: (3\*25) + (.1\*-149)= 60.1$

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| --- | --- | --- | --- | --- |
| **End item aa, Level4** | | | | |
| **Lead time: 1**  **Lot size: LFL** | | **Period** | | | | | | | |
| **1** | | **2** | **3** | **4** | **5** | | **6** |
|  | |  |  |  |  | |  |
| **Demand** | | 934 | | 200 | 0 | 0 | 40 | | 0 |
| **Receipts** | |  | | 934 |  |  | 40 | |  |
| **On hand** | **200** | -734 | | 0 | 0 | 0 | 0 | | 0 |
| **Order** | | 934 | |  |  | 40 |  | |  |

Total Cost: (2\*25) + (.1\*-734)= -23.4$

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| **End item bb, Level4** | | | | |
| **Lead time: 1**  **Lot size: LFL** | | **Period** | | | | | | | |
| **1** | | **2** | **3** | **4** | **5** | | **6** |
|  | |  |  |  |  | |  |
| **Demand** | | 1899 | | 268 | 20 | 0 | 30 | | 0 |
| **Receipts** | |  | | 1867 | 20 |  | 30 | |  |
| **On hand** | **300** | -1599 | | 0 | 0 | 0 | 0 | | 0 |
| **Order** | | 1867 | | 20 |  | 30 |  | |  |

Total Cost: (3\*25) + (.1\*-1599)= -1524 $