**IE 7200 Supply Chain Engineering**

**Aven Samareh**

**Homework #4**

**Problem 1.**

**Plan 1:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Month** | **Production days** | | **Production rate** | **Produced items** | **Demand** | **Inventory change** | **Inventory Balance with 50 on-hand** |
|  | **RT** | **OT** |  |  |  |  |  |
| **January** | 22 |  | 4 | 88 | 50 | 38 | 88 |
| **February** | 18 |  | 4 | 72 | 60 | 12 | 100 |
| **March** | 23 |  | 4 | 92 | 70 | 22 | 122 |
| **April** | 21 |  | 4 | 84 | 65 | 19 | 191 |
| **May** | 22 |  | 4 | 88 | 55 | 33 | 179 |
| **June** | 21 |  | 4 | 84 | 80 | 4 | 178 |
| **July** | 20 |  | 4 | 80 | 250 | -170 | 8 |
| **August** | 20 | 3 | 5 | 115 | 250 | -135 | -127 |
| **September** | 22 | 4 | 5 | 130 | 110 | 20 | -107 |
| **October** | 22 | 4 | 5 | 130 | 100 | 30 | -77 |
| **November** | 21 | 3 | 5 | 120 | 80 | 40 | -37 |
| **December** | 20 | 2 | 5 | 110 | 60 | 50 | 13 |

**Cost calculations:**

Lay off + hiring = 500+ 900 = $900

Inventory cost = (88+100+122+141+174+178+8+13)\*25 = $ 20600

Shortage cost = (127 + 107+77+37)\*50=$17400

Production Cost= 1113\*300+80\*900= $365400

Total Cost = 90+20600+117400+365400 = **$ 404800**

**Plan 2:**

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| --- | --- | --- | --- | --- |
| **Month** | **Production days** | **Forecast** | **Inventory change** | **Inventory Balance with 50 on-hand** |
| **January** | 22\*9=88 | 50 | 38 | 88 |
| **February** | 18\*4=72 | 60 | 12 | 100 |
| **March** | 23\*4=42 | 70 | 22 | 122 |
| **April** | 21\*5=105 | 65 | 40 | 162 |
| **May** | 22\*5=110 | 55 | 55 | 217 |
| **June** | 21\*5=105 | 80 | 25 | 242 |
| **July** | 20\*5=100 | 250 | -150 | 92 |
| **August** | 20\*5=100 | 250 | -150 | -58 |
| **September** | 22\*5=110 | 110 | 0 | -58 |
| **October** | 22\*5=110 | 100 | 10 | -48 |
| **November** | 21\*5=105 | 80 | 25 | -23 |
| **December** | 20\*5=100 | 60 | 40 | 17 |

**Cost Calculations:**

Cost of lay off =hiring = 500 + 400 = **$900**

Inventory cost= (88+100+122+162+217+242+92+17)\*25=$**26000**

Shortage cost= (58+58+48+23)\*50=**$9350**

Production cost= 1197\*300+0=**$359100**

**Total cost=359100+9350+26000+900 = $395350**

**Plan 3:**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Month** | **Production days** | | **Production rate** | **Produced items** | **Demand** | **Inventory change** | **Inventory Balance with 50 on-hand** |
|  | **RT** | **OT** |  |  |  |  |  |
| **January** | 22 |  | 3 | 66 | 50 | 16 | 66 |
| **February** | 18 |  | 3 | 54 | 60 | -6 | 60 |
| **March** | 23 |  | 3 | 69 | 70 | -1 | 54 |
| **April** | 21 |  | 3 | 63 | 65 | -2 | 57 |
| **May** | 22 |  | 3 | 66 | 55 | 11 | 68 |
| **June** | 21 |  | 3 | 63 | 80 | -17 | 51 |
| **July** | 20 |  | 3 | 60 | 250 | -190 | -134 |
| **August** | 20 | 3 | 5 | 115 | 250 | -135 | -274 |
| **September** | 22 | 4 | 5 | 130 | 110 | 20 | -254 |
| **October** | 22 | 4 | 5 | 130 | 100 | 30 | -224 |
| **November** | 21 | 3 | 5 | 120 | 80 | 40 | -184 |
| **December** | 20 | 2 | 5 | 110 | 60 | 50 | -134 |

**Cost calculations:**

Hiring + lay off cost = (400+500)\*2=$1800

Inventory cost= (66+60+59+57+68+51)\*25=$9025

Shortage cost= (138+274+259+224+184+134)\*50=$60450

Production cost= 966\*300+80\*400=$321800

**Total cost= 1800+9025+60450+321800=$393075**

**Among all the plans Plan C has the minimum cost**

**Problem 2.**

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|  | **Period 1** | | **Period 2** | | **Period 3** | | **Period 4** | | **Final inventory** | | **Slack** | | **Capacity** |
| **Initial Inventory** |  |  |  |  |  |  |  |  |  |  |  |  | **20** |
|  |  |  |  |  |  | |
| **Period-1-In** |  |  |  |  |  |  |  |  |  |  |  |  | **30** |
|  | |  | |  | |  | |  | |  | |
| **Period-1-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
|  |  | |  | |  | |  | |  | |
| **Period-2-In** |  |  |  |  |  |  |  |  |  |  |  |  | **40** |
|  |  | |  | |  | |  | |  | |
| **Period-2-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
|  |  |  |  |  |  |
| **Period-3-In** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
|  |  |  |  |  |  |
| **Period-3-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
|  |  |  |  |  |  |
| **Period-4-In** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
|  |  |  |  |  |  |
| **Period-4-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
|  |  | |  |  | |  | |  | |
| **Demand** | **60** | | **80** | | **100** | | **120** | | **20** | | **70** | | **450 450** |

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|  | **Period 1** | | **Period 2** | | **Period 3** | | **Period 4** | | **Final inventory** | | **Slack** | | **Capacity** |
| **Initial Inventory** |  |  |  |  |  |  |  |  |  |  |  |  | **20** |
|  |  |  |  |  |  | |
| **Period-1-In** |  |  |  |  |  |  |  |  |  |  |  |  | **30** |
|  | |  | |  | |  | |  | |  | |
| **Period-1-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
|  |  | |  | |  | |  | |  | |
| **Period-2-In** |  |  |  |  |  |  |  |  |  |  |  |  | **40** |
|  |  | |  | |  | |  | |  | |
| **Period-2-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
|  |  |  |  |  |  |
| **Period-3-In** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
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| **Period-3-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
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| **Period-4-In** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
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| **Period-4-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
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| **Period-4-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
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| **Period-3-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
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| **Period-4-In** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
|  |  |  |  |  |  |
| **Period-4-Out** |  |  |  |  |  |  |  |  |  |  |  |  | **60** |
|  |  | |  |  | |  | |  | |
| **Demand** | **60** | | **80** | | **100** | | **120** | | **20** | | **70** | | **450 450** |