HW 8

Mohsen Nabian

Problem 1)

Sep
Oct
Nov
Dec

- Production starts 12 months before selling season
- distributor places order with manufacturer six month after begin of production
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Demand	P	
10,000	0.12	dis
12,000	0.15	
14,000	0.20	
16,000	0.25	
18,000	0.18	man
20,000	0.1	

dis: distributers sells 80$/unit
\" Pays 60$/unit

man: Fixed Prod. Cost = 75000$
Prod. Cost = 50$/unit
not sold by dis will be bought 25$/unit

P1) Make-to-Stock (no Contract)

Manufacture Produce 10000				
Demand	P	Revenue	Cost	Profit
10000	0.12	600000	575000	25000
12000	0.15	600000	575000	25000
14000	0.2	600000	575000	25000
16000	0.25	600000	575000	25000
18000	0.18	600000	575000	25000
20000	0.1	600000	575000	25000
			Expected Profit	25000

Manufacture Produce 16000				
Demand	P	Revenue	Cost	Profit
10000	0.12	750000	875000	-125000
12000	0.15	820000	875000	-55000
14000	0.2	890000	875000	15000
16000	0.25	960000	875000	85000
18000	0.18	960000	875000	85000
20000	0.1	960000	875000	85000
			Expected Profit	24800

Manufacture Produce 12000				
Demand	P	Revenue	Cost	Profit
10000	0.12	650000	675000	-25000
12000	0.15	720000	675000	45000
14000	0.2	720000	675000	45000
16000	0.25	720000	675000	45000
18000	0.18	720000	675000	45000
20000	0.1	720000	675000	45000
			Expected Profit	36600

Manufacture Produce 18000				
Demand	P	Revenue	Cost	Profit
10000	0.12	800000	975000	-175000
12000	0.15	870000	975000	-105000
14000	0.2	940000	975000	-35000
16000	0.25	1010000	975000	35000
18000	0.18	1080000	975000	105000
20000	0.1	1080000	975000	105000
			Expected Profit	-5600

Manufacture Produce 14000				
Demand	P	Revenue	Cost	Profit
10000	0.12	700000	775000	-75000
12000	0.15	770000	775000	-5000
14000	0.2	840000	775000	65000
16000	0.25	840000	775000	65000
18000	0.18	840000	775000	65000
20000	0.1	840000	775000	65000
			Expected Profit	**37700**

Manufacture Produce 20000				
Demand	P	Revenue	Cost	Profit
10000	0.12	850000	1075000	-225000
12000	0.15	920000	1075000	-155000
14000	0.2	990000	1075000	-85000
16000	0.25	1060000	1075000	-15000
18000	0.18	1130000	1075000	55000
20000	0.1	1200000	1075000	125000
			Expected Profit	-48600

optimal = 14000

Expected Profit = 37700

P2) (Pay-back Contract)

Manufacture Produce 10000				
Demand	P	Revenue	Cost	Profit
10000	0.12	600000	575000	25000
12000	0.15	600000	575000	25000
14000	0.2	600000	575000	25000
16000	0.25	600000	575000	25000
18000	0.18	600000	575000	25000
20000	0.1	600000	575000	25000
			Expected Profit	25000

Manufacture Produce 16000				
Demand	P	Revenue	Cost	Profit
10000	0.12	840000	875000	-35000
12000	0.15	880000	875000	5000
14000	0.2	920000	875000	45000
16000	0.25	960000	875000	85000
18000	0.18	960000	875000	85000
20000	0.1	960000	875000	85000
			Expected Profit	**50600**

Manufacture Produce 12000				
Demand	P	Revenue	Cost	Profit
10000	0.12	680000	675000	5000
12000	0.15	720000	675000	45000
14000	0.2	720000	675000	45000
16000	0.25	720000	675000	45000
18000	0.18	720000	675000	45000
20000	0.1	720000	675000	45000
			Expected Profit	40200

Manufacture Produce 18000				
Demand	P	Revenue	Cost	Profit
10000	0.12	920000	975000	-55000
12000	0.15	960000	975000	-15000
14000	0.2	1000000	975000	25000
16000	0.25	1040000	975000	65000
18000	0.18	1080000	975000	105000
20000	0.1	1080000	975000	105000
			Expected Profit	41800

Manufacture Produce 14000				
Demand	P	Revenue	Cost	Profit
10000	0.12	760000	775000	-15000
12000	0.15	800000	775000	25000
14000	0.2	840000	775000	65000
16000	0.25	840000	775000	65000
18000	0.18	840000	775000	65000
20000	0.1	840000	775000	65000
			Expected Profit	49400

Manufacture Produce 20000				
Demand	P	Revenue	Cost	Profit
10000	0.12	1000000	1075000	-75000
12000	0.15	1040000	1075000	-35000
14000	0.2	1080000	1075000	5000
16000	0.25	1120000	1075000	45000
18000	0.18	1160000	1075000	85000
20000	0.1	1200000	1075000	125000
			Expected Profit	25800

optimal = 16000

expected profit = 50600

P3) Cost-Sharing Contract

Manufacture Produce 10000				
Demand	P	Revenue	Cost	Profit
10000	0.12	500000	460000	40000
12000	0.15	500000	460000	40000
14000	0.2	500000	460000	40000
16000	0.25	500000	460000	40000
18000	0.18	500000	460000	40000
20000	0.1	500000	460000	40000
			Expected Profit	40000

Manufacture Produce 16000				
Demand	P	Revenue	Cost	Profit
10000	0.12	650000	700000	-50000
12000	0.15	700000	700000	0
14000	0.2	750000	700000	50000
16000	0.25	800000	700000	100000
18000	0.18	800000	700000	100000
20000	0.1	800000	700000	100000
			Expected Profit	57000

Manufacture Produce 12000				
Demand	P	Revenue	Cost	Profit
10000	0.12	550000	540000	10000
12000	0.15	600000	540000	60000
14000	0.2	600000	540000	60000
16000	0.25	600000	540000	60000
18000	0.18	600000	540000	60000
20000	0.1	600000	540000	60000
			Expected Profit	54000

Manufacture Produce 18000				
Demand	P	Revenue	Cost	Profit
10000	0.12	700000	780000	-80000
12000	0.15	750000	780000	-30000
14000	0.2	800000	780000	20000
16000	0.25	850000	780000	70000
18000	0.18	900000	780000	120000
20000	0.1	900000	780000	120000
			Expected Profit	41000

Manufacture Produce 14000				
Demand	P	Revenue	Cost	Profit
10000	0.12	600000	620000	-20000
12000	0.15	650000	620000	30000
14000	0.2	700000	620000	80000
16000	0.25	700000	620000	80000
18000	0.18	700000	620000	80000
20000	0.1	700000	620000	80000
			Expected Profit	**60500**

Manufacture Produce 20000				
Demand	P	Revenue	Cost	Profit
10000	0.12	750000	860000	-110000
12000	0.15	800000	860000	-60000
14000	0.2	850000	860000	-10000
16000	0.25	900000	860000	40000
18000	0.18	950000	860000	90000
20000	0.1	1000000	860000	140000
			Expected Profit	16000

optimal = 14000 e. profit = 60500

Problem 4 :

Average demand/week = 150 ± 75

Hobling Cost = 40%

Cycle service Level = 0.95

Reliable Corporat : 5000 $/unit
minimum order = 150
lead tike = 7 ± 0.1

Value Electric : 4.000 $/unit
minimum order = 1500
lead tre = 5 ± 4

Reliable Comp:

Material cost = $150 \times 52 \times 5000 = 39{,}000{,}000$

Cycle inventory = $\frac{150}{2} = 75$

Cycle inventory Cost = $75 \times 5000 \times 0.4 = 150000$

$\sigma_L = \sqrt{L\sigma_D^2 + D^2 S_L^2} = \sqrt{7 \times 75^2 + 150^2 \times (0.1)^2} = 76.49$

$SS = F_S^{-1}(CSL)\,\sigma_L = F_S^{-1}(0.95) \times 76.49 = 125.83$

($F_S^{-1}(0.95) = 1.645$, $150^2 \times (0.1)^2 = 225$)

Safety inventory Cost = $SS \times 5000 \times 0.4 = 251652$

($SS \downarrow 125.83$)

Total Cost = $39{,}000{,}000 + 150{,}000 + 251{,}652$

$= \underline{39{,}401{,}652\ \$}$

Value Electric :

Material Cost = 150 × 52 × 4000 = 31,200,000

Cycle inventory Cost = $\frac{1500}{2} \times 4000 \times 0.4$ = 1,200,000

$\sigma_L = \sqrt{\underbrace{5 \times 75^2}_{28125} + \underbrace{150 \times 4^2}_{360,000}} = 623$

$SS = \underbrace{F_S^{-1}(0.95)}_{1.645} \times \sigma_L = 1.645 \times 623 = 1024.8$

Safety inventory Cost = $\underset{1024.8}{SS} \times 4000 \times 0.4$ = 1,639,680

Total Cost = 31,200,000 + 1,200,000 + 1,639,680 = 34,039,680 $

⇒ Value Electric is prefered due to Lower Cost.

Supplier II