BUSI4496 Supply Chain Planning and Management

Inventory Management Solutions

Problem 1:

(a) $K = 100$ $I = .25$

	Hex Nuts	Molly Screws
	$c = .15$	$c = .38$
	$\lambda = 20{,}000$	$\lambda = 14{,}000$

For hex nuts: $$Q^*_1 = \sqrt{\frac{(2)(100)(20{,}000)}{(.25)(.15)}} = 10{,}328$$

$$T_1 = Q^*_1/\lambda = .5164 \text{ years}$$

For molly screws: $$Q^*_2 = \sqrt{\frac{(2)(100)(14{,}000)}{(.25)(.38)}} = 5{,}429$$

$$T_2 = Q^*_2/\lambda = .3878 \text{ years}$$

(b) 1. Average annual cost when ordered separately:

$$\sqrt{(2)(100)(20{,}000)(.25)(.15)} + \sqrt{(2)(100)(14{,}000)(.25)(.38)}$$

$$= \$387.30 + \$515.75 = \$903.05$$

2 If both products are ordered when the hex nuts are ordered (every .5164 yrs.), then hex nut cost is the same. Molly screw cost is <u>only</u> the holding cost.

$Q_{molly} = \lambda T_1 = (14{,}000)(.5164) = 7230.$

Holding cost $= (7230/2)(.25)(.38) = \$343.43$

Total cost of this policy $= \$387.30 + \$343.43 = \$730.73$
(a savings of \$172.32 annually from ordering separately).

3. If both products are ordered when the molly screws are normally ordered (every .3878 yrs.), then the lot size for the hex nuts is:

$Q_{hexnuts} = \lambda T_2 = (20{,}000)(.3878) = 7756$

Holding cost $= (7756/2)(.25)(.15) = \$145.43$
The total cost of this policy is \$515.75 + \$145.43 = \$661.18 which represents a savings of \$241.87 over ordering separately.

Problem 2:

(a) Monthly demand is normal ($\mu = 28, \ \sigma = 8$)

ι = 14 weeks = 3.5 months $\Rightarrow$ Lead time demand ~ normal

with $\mu = (28)(3.5) = 98$ $\sigma = (8)\sqrt{3.5} = 15$

h = Ic = (.3)(6) = 1.8 $\lambda = (28)(12) = 336$ year

p = 10 K = 15

$$Q = EOQ = \sqrt{\frac{(2)(336)(15)}{1.8}} = 75$$

1 - F(R) = .10, z = 1.28, R = $\sigma z + \mu = (15)(1.28) + 98 = 117$

(Q,R) = (75,117)

(b) SS = R - μ = 117 - 98 = 19 units.

(c) Find Type II service level achieved in part (a).

$$\frac{n(R)}{Q} = 1 - \beta = \frac{\sigma L(z)}{Q} = \frac{(15)(.0475)}{75} = .0095$$

$\Rightarrow$ β = .9905 (99.05% service level)

Problem 3:

(a): Q = 300; R = 300; safety stock SS = R – demand during lead time =

300 – 2*100 = 100

(b) fill rate β = 1-n(R)/Q = 1-50*0.0085/300 = 99.86%

(c) Q = EOQ = sqrt(2Kλ/h) = sqrt(2*50*1200/3) = 200

n(R)/Q = 1-β = 0.02 n(R) = 4 and L(z) = 4/50 = 0.08

for L(z) = 0.08 we find z = 1.02

R = 200 + 1.02*50 = 251