MGT236
Inventory Management

Problem 1:

D = 15,000, H = \$25/unit/year, S = \$75

a) $\text{EOQ} = \sqrt{\frac{2DS}{H}} = \sqrt{\frac{2 \times 15{,}000 \times 75}{25}} = 300 \text{ units}$

b) Annual holding costs = $(Q/2) \times H = (300/2) \times 25 = \$3{,}750$

c) Annual ordering costs = $(D/Q) \times S = (15{,}000/300) \times 75 = \$3{,}750$

d) $\text{ROP} = d \times L = \left(\frac{15{,}000 \text{ units}}{300 \text{ days}} \right) \times 2 \text{ days} = 100 \text{ units}$

Problem 2:

Reorder point = demand during lead time = 100 units/day × 21 days = 2,100 units

Problem 3:

a) Total cost = order cost + holding cost $= \frac{DS}{Q} + \frac{QH}{2}$

For $Q = 25$: $= \frac{1{,}200 \times 25}{25} + \frac{25 \times 24}{2} = \$1{,}500$

For $Q = 40$: $= \frac{1{,}200 \times 25}{40} + \frac{40 \times 24}{2} = \$1{,}230$

For $Q = 50$: $= \frac{1{,}200 \times 25}{50} + \frac{50 \times 24}{2} = \$1{,}200$

For $Q = 60$: $= \frac{1{,}200 \times 25}{60} + \frac{60 \times 24}{2} = \$1{,}220$

For $Q = 100$: $= \frac{1{,}200 \times 25}{100} + \frac{100 \times 24}{2} = \$1{,}500$

As expected, small variations in order quantity will not have a significant effect on total costs.

b) Economic Order Quantity:

$Q = \sqrt{\frac{2DS}{H}} = \sqrt{\frac{2 \times 1{,}200 \times 25}{24}} = 50 \text{ units}$

where: D = annual demand, S = setup or order cost, H = holding cost

Problem 4:

a) Economic Order Quantity:

$Q = \sqrt{\frac{2DS}{H}} = \sqrt{\frac{2 \times 6{,}000 \times 30}{10}} = 189.7 \text{ or } 190 \text{ units}$

where: D = annual demand, S = setup or order cost, H = holding cost

b) Average inventory = 95 valves

c) Number of orders per year $= \frac{\text{Demand}}{\text{EOQ}} = \frac{6{,}000}{190} = 31.57 \text{ or } 32 \text{ orders}$

d) Assuming 250 business days per year, the optimal number of business days between orders is given by:

Optimal number of days $= \frac{250}{32} = 7.81$ days

e) Total annual inventory cost = Order cost + holding cost $= \frac{DS}{Q} + \frac{QH}{2}$

$= \frac{6,000 \times 30}{189.7} + \frac{189.7 \times 10}{2} = 948.86 + 948.5 = \$1,897.36$

Note: Order and carrying costs are not equal due to rounding of the EOQ to a whole number.

f) Reorder point = demand during lead time = 24 units/day × 5 days = 80 valves

Problem 5:

a) D = 12,000/yr., H = \$.10/light-yr., S = \$50/setup, P = \$1.00/light, p = 100/day,

$d = \frac{12,000/\text{yr.}}{300 \text{ days/yr.}} = 40/\text{day}$

$Q = \sqrt{\frac{2DS}{H\left(1 - \frac{d}{p}\right)}} = \sqrt{\frac{2(12,000)50}{.10\left(1 - \frac{40}{100}\right)}}$

$= 4,472$ lights per run

b)

$$\text{Average holding cost/year} = \frac{Q}{2}\left[1 - \left(\frac{d}{p}\right)\right]H = \frac{4,472}{2}\left[1 - \left(\frac{40}{100}\right)\right](.10) = \frac{\$26,832}{200} = \$134.16$$

c) $$\text{Average setup cost/year} = \left(\frac{D}{Q}\right)S = \left(\frac{12,000}{4,472}\right)50 = \$134.16$$

d) Total cost (including cost of goods) = PD + \$134.16 + \$134.16

= (\$1 × 12,000) + \$134.16 + \$134.16

= \$12,268.32/year

Problem 6:

a)

$$Q = \sqrt{\frac{2DS}{H\left(1 - \frac{d}{p}\right)}} = \sqrt{\frac{2 \times 10,000 \times 40}{0.60\left(1 - \frac{50}{500}\right)}} = 1217.2 \text{ or } 1,217 \text{ units}$$

where: D = annual demand, S = setup or order cost, H = holding cost, d = daily demand rate, p = daily production rate

b) $I_{\max} = Q\left(1 - \frac{d}{p}\right) = 1,095$

c) $\frac{D}{Q} = \frac{10,000}{1,217} = 8.22$

d) $TC = \frac{I_{\max}}{2}H + \frac{D}{Q}S = 328.50 + 328.80 = \$657.30$