CHAPTER 4 – EXAMPLES

Problem 1 *(lead time variability)*:

A materials manager for ABC Manufacturing has provided the following data for one of their widely used components: Demand is N(10 pcs/week, 9/week). Replenishment lead time for the component follows normal distribution with a mean of 2 weeks and a variance of 2 weeks. Given that the desired service level (the probability of no stockout during lead time) is 95%. Find R.

SOLUTION:

$E(D) = 10; Var(D) = 9; E(L) = 2; Var(L) = 2; G(R) = 0.95$

Demand during lead time:

- $\theta = E(X) = E(L) \times E(D) = 2 \times 10 = 20$
- $\sigma = \sqrt{Var(X)} = \sqrt{E(L)Var(D) + E(D)^2 Var(L)} = \sqrt{2 \times 9 + 10^2 \times 2} = 14.765$

$G(R) = 0.95$ → $z = 1.645$ (using z-table) → $R = \theta + z\sigma = 20 + 1.645 \times 14.765 \approx 44$

Problem 2 *((R, S) policy – Period review system)*:

A special control board is used in a version of a product on the production line. The board cost (C) is \$122.50. The holding cost rate (i) is 30% per year. Reorders are placed at the beginning of each week (R), and the supplier delivers these parts in one week (L). Weekly demand is $N(\mu = 125, \sigma^2 = 104.17)$. Set up cost ($A$) is \$120. Assuming that there are 52 weeks in a year.

Find S if the shortage cost (or the penalty cost) due to the workers' downtime is:

a) $p = \$100$
b) $p = \$10$
c) $p = \$1$

SOLUTION:

	a) $p = \$100$	**b)** $p = \$10$	**c)** $p = \$1$
h *(holding cost **per week**)*	$h = iC = 0.30 \times 122.50 \times \frac{1}{52} = \$0.7067$		
$G(S)$	$G(S) = \frac{p - hR}{p} = \frac{100 - 0.7067 \times 1}{100} = 0.993$	$G(S) = \frac{p - hR}{p} = \frac{10 - 0.7067 \times 1}{10} = 0.929$	$G(S) = \frac{p - hR}{p} = \frac{1 - 0.7067 \times 1}{1} = 0.293$
z *(using z-table)*	$z = 2.457$	$z = 1.468$	$z = -0.545$
S	$S = \mu + z\sigma = 125 + 2.457 \times \sqrt{104.17} \approx 150$	$S = \mu + z\sigma = 125 + 1.468 \times \sqrt{104.17} \approx 140$	$S = \mu + z\sigma = 125 - 0.545 \times \sqrt{104.17} \approx 119$