VG441 PS2 周翔凯 518021911039

1. ① All-units discount:

$\lambda=500,\ K=2250,\ i=\frac{0.25}{365}=6.85\times10^{-4}$

$$Q_2^*=\sqrt{\frac{2\times2250\times500}{6.85\times10^{-4}\times1100}}=1728.02$$

$$Q_1^*=\sqrt{\frac{2\times2250\times500}{6.85\times10^{-4}\times1220}}=1640.83$$

$$Q_0^*=\sqrt{\frac{2\times2250\times500}{6.85\times10^{-4}\times1490}}=1484.75$$

Only Q_1^* is realizable, and it has cost

$$1220\times500+\sqrt{2\times2250\times500\times6.85\times10^{-4}\times1220}=6.11\times10^5$$

Next, we calculate the cost of the breakpoints to the right of Q_1^*.

$$g_2(2400)=1100\times500+\frac{2250\times500}{2400}+\frac{6.85\times10^{-4}\times1100\times2400}{2}=5.51\times10^5$$

Therefore, the optimal order quantity is $Q=2400$, which incurs a total anual cost of $5.51\times10^5\times365=2.01\times10^8$ dollar.

② $\bar{c}_1=1490\times1200-1220\times1200=3.24\times10^5$

$\bar{c}_2=1490\times1200+1220\times1200-1100\times2400=6.12\times10^5$

Next, we calculate Q_j^* for each j:

$$Q_0^*=\sqrt{\frac{2(2250+0)500}{6.85\times10^{-4}\times1490}}=1484.75$$

$$Q_1^*=\sqrt{\frac{2(2250+3.24\times10^5)500}{6.85\times10^{-4}\times1220}}=19758.32$$

$$Q_2^*=\sqrt{\frac{2(2250+6.12\times10^5)500}{6.85\times10^{-4}\times1100}}=28551.63$$

Only Q_2^* is realizable

$$g_2(Q_2^*)=1100\times500+\frac{6.85\times10^{-4}\times6.12\times10^5}{2}+\sqrt{2(2250+6.12\times10^5)\times500\times6.85\times10^{-4}\times1100}$$

$$=5.72\times10^5$$

Therefore, the optimal order quantity is $Q=28551.63$, which incurs a total anual cost of $5.72\times10^5\times365=2.09\times10^8$ dollar.