Student Information

Full Name: Burak Yıldız

Id Number: 2449049

Answer 1

(a)

Since it is given that Normal approximation can be used, the following formula can be used to determine the size of the Monte Carlo study:

$$\mathrm{N} \geq 0.25 \left(\frac{z_{\alpha/2}}{\varepsilon}\right)^2$$

In question the followings are given,

$$\alpha = 0.02 \quad \varepsilon = 0.03$$

So,

$$\begin{aligned} \mathrm{N} &\geq 0.25 \left(\frac{z_{0.005}}{0.02}\right)^2 \\ &\geq 0.25 \left(\frac{2.325}{0.03}\right)^2 \\ &\geq 1508.0277 \end{aligned}$$

Since N should be a integer, **1509** is the size of Monte Carlo study.

Answer 2

Algorithm 5.1 of the textbook can be used because the weights have Poisson distribution.

Since the weight of cargo has a Gamma random variable, the formula from example 5.11 can be used. This value may be used to estimate the probability.

By using the matlab code that is provided (hw4.m);

- The estimated probability of having the total weight of all cargo in a day more than 300000 tons is **0.113983**
- The estimated total weight of all cargo in a day is **259292.573843** tons
- The estimated Standard deviation is **32976.185186**. In this simulation $\alpha = 0.02$ and $\varepsilon = 0.03$ are used, so the study yields to accurate results within the error margin of 0.03 and 0.98% of the time.

  Since the theoretical Standard deviation is $\mathrm{Std}(X) = \frac{\sigma}{\sqrt{N}}$, $\mathrm{Std}(X)$ can be reduced by using the larger study sizes.

The screenshot of the output of `hw4.m`,

```
Estimated probability = 0.113983
Expected weight = 259292.573843
Standard deviation = 32976.185186
```