

## CEng 222 HW4 ANSWER SHEET

NAME: Hasan Berk Uzunova

ID: 2376028

Q1.)

$$a.) N \leq 0.25 (z_{\alpha/2} / \epsilon)^2$$

$$N \leq 0.25 (z_{0.005} / 0.02)^2$$

$$N \leq 0.25 (2.575 / 0.02)^2 \text{ (from z-table)}$$

So  $N \geq 4144.14$  ; Size of Monte Carlo Simulation need to be 4145.

b.)

Expected Value :  $\alpha / \lambda$

For an automobile:  $190 / 0.15 = 1266.67$

For a truck:  $110 / 0.01 = 11000$

Total Weights of All Automobiles:  $50 * 1266.67 = 63333.5$

Total Weights of All Trucks:  $10 * 11000 = 110000$

Q2.)

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Estimated probability = 0.225090  
Expected weight = 173419.027428  
Standard deviation = 36178.337403
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According to Monte Carlo Simulation, these are the values of the estimated probability that the total weight of all the vehicles that pass over the bridge on a day is more than 200 tons. , the expected total weight of all the vehicles that pass over the bridge on a day and the standard deviation of the estimator of X.

When we carry out our simulation, we found a specific size to get 99% confidence with 0.02 error margin ( $N=4145$  ). Since we know that bigger size provides us much more correct values, it supports our estimation. Also we found a small standard deviation when we compare it with actual value, Also the expected values are very close to the simulated ones. All of these support our estimation's accuracy.