

COMPENG 4DK4 Lab 3 Report

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Random Number Generator Seeds

For the experiments in this lab, we used the same set of 18 random number seeds for all experiments. Experiment 2 instructs us to include runs with our *McMaster Student ID numbers* as our seeds. We used our *McMaster IDs* and shifted them by one digit at a time to create 9 different seeds from each our IDs, for a total of 18 different seeds. All the random number generator seeds can be seen in Table 1. In the C code used for the experiments, leading zeroes are removed.

400188200	400190637
001882004	001906374
018820040	019063740
188200400	190637400
882004001	906374001
820040018	063740019
200400188	637400190
004001882	374001906
040018820	740019063

Table 1: Random Number Generator Seeds

Experiment 2

The set of curves that show the tradeoffs between blocking probability, offered load (in Erlangs) and the number of channels can be seen in Figure 1. We can observe that the blocking probability decreases as the number of channels increase, and increasing the offered load will increase the blocking probability at a given number of channels.

When plotting these results with the Erlang B formula in MATLAB, we observe the same results with essentially identical curves as seen in Figure 2. The MATLAB code used to calculate the Erlang B formula can be seen in Listing 1. We compared several of our results of from our program with an [online Erlang B calculator](#) and had matching results. For example, for $A = 5$, $N = 10$, both calculated $P_B = 0.184$.

Listing 1: Erlang B Formula

```
3 syms k
4
5 for A = 1:20
6     for N = 1:20
7         PB(A,N) = ((A^N)/factorial(N))/symsum(A^k/
8             factorial(k),k,0,N);
9     end
10 end
```

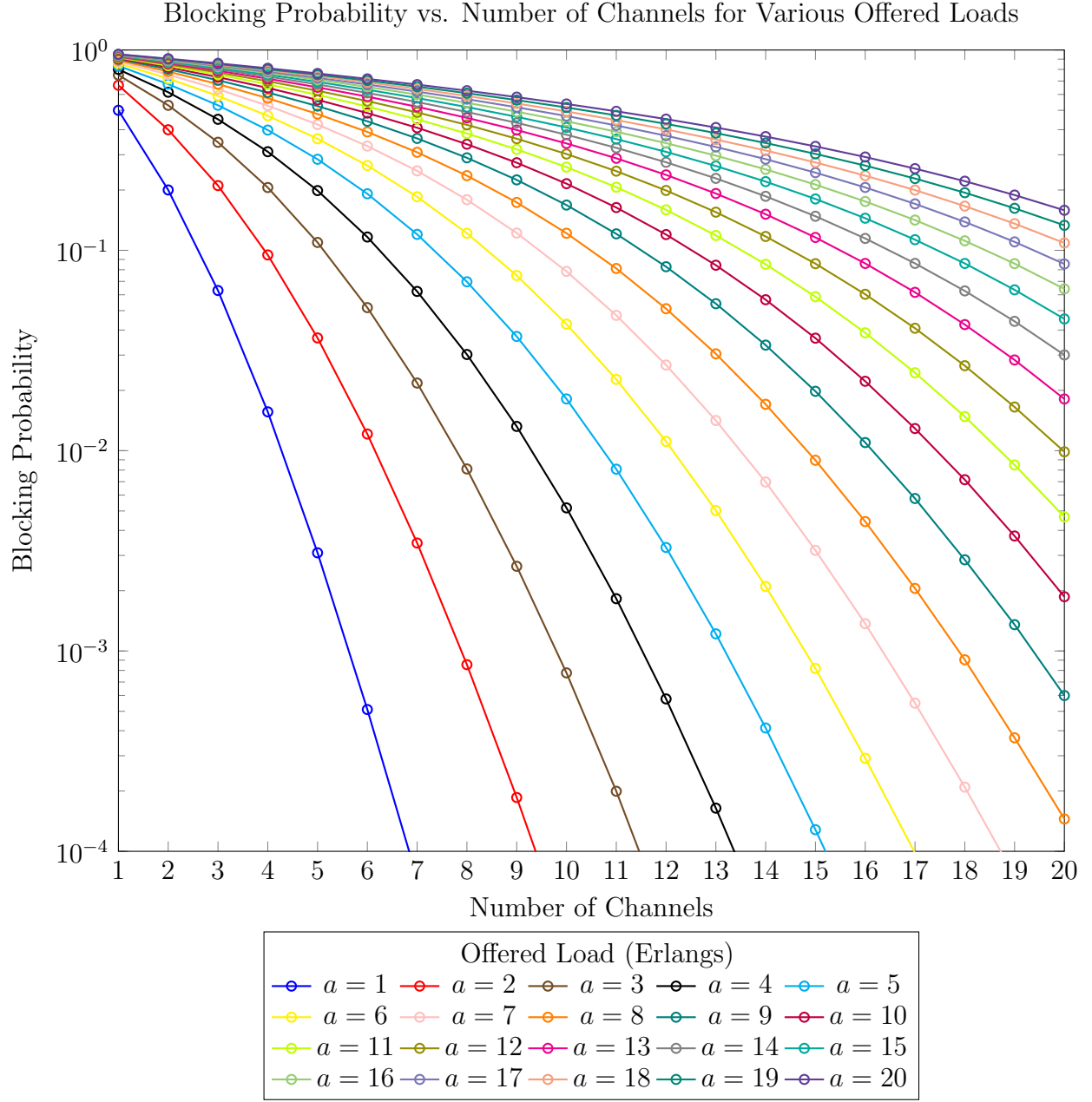


Figure 1: Experiment 2: Simulation

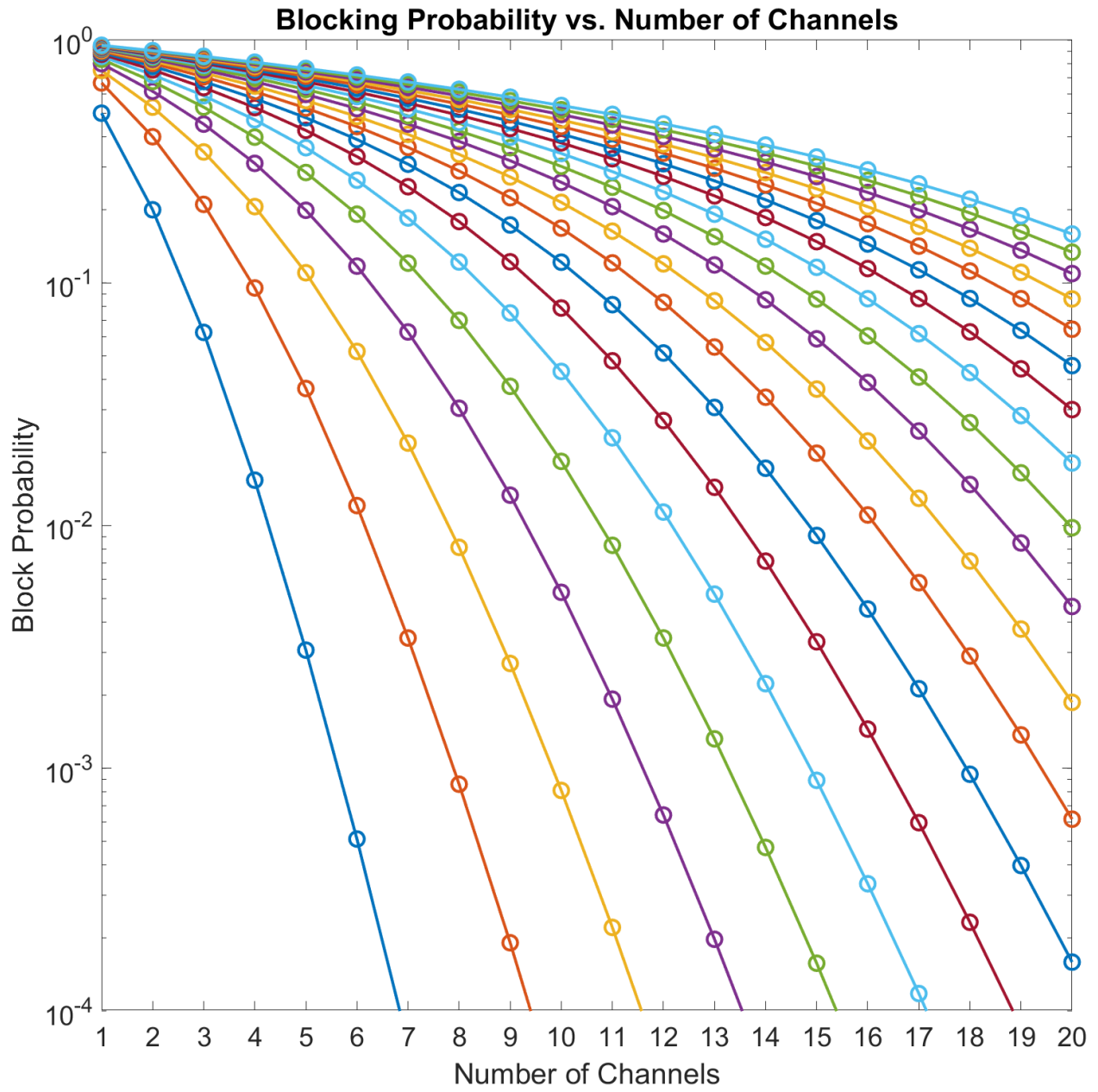


Figure 2: Experiment 2: MATLAB

Experiment 3

The maximum offered loading (in Erlangs) versus the number of cellular channels needed to achieve a 1% blocking probability is graphed on Figure 3. The minimum number of cellular channels required to have an "acceptable" cellular network with less than 1% blocking probability is 5 cellular channels, which remains acceptable for a maximum offered load of 1 Erlang. The increase in the maximum offered loading follows demonstrates mostly linear growth.

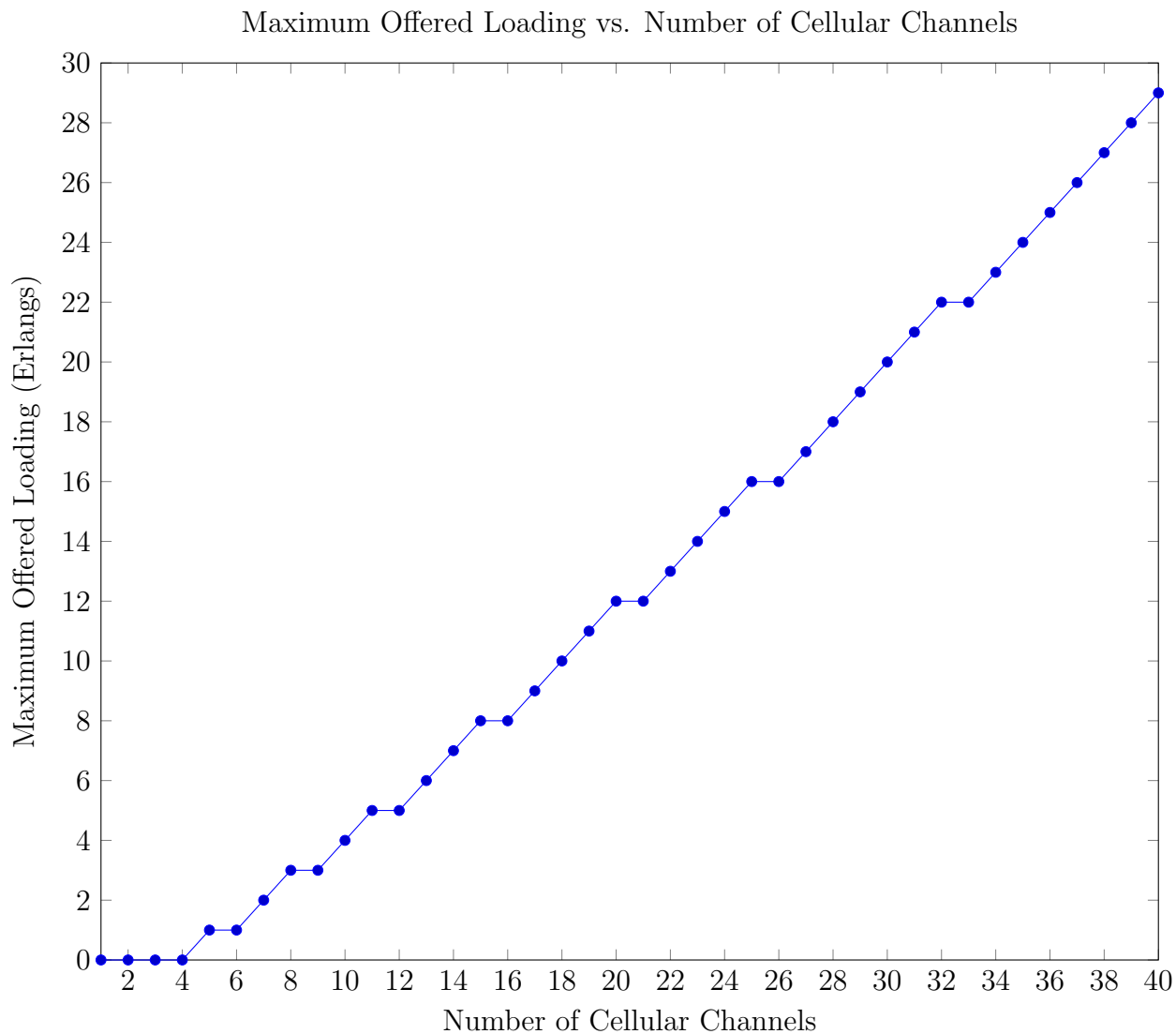


Figure 3: Experiment 3

Experiment 4

Experiment 5

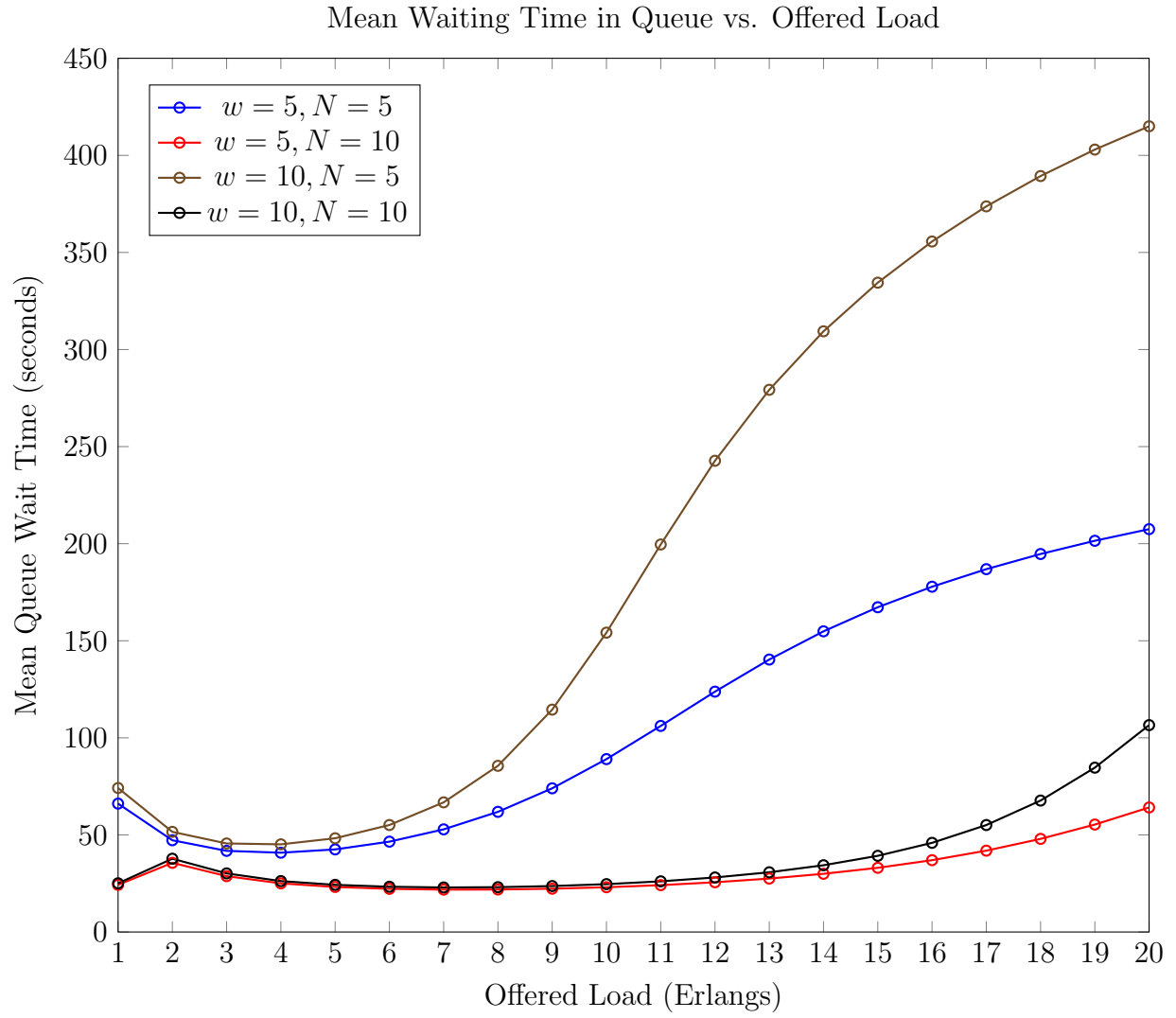


Figure 4: Experiment 4: Mean Delay

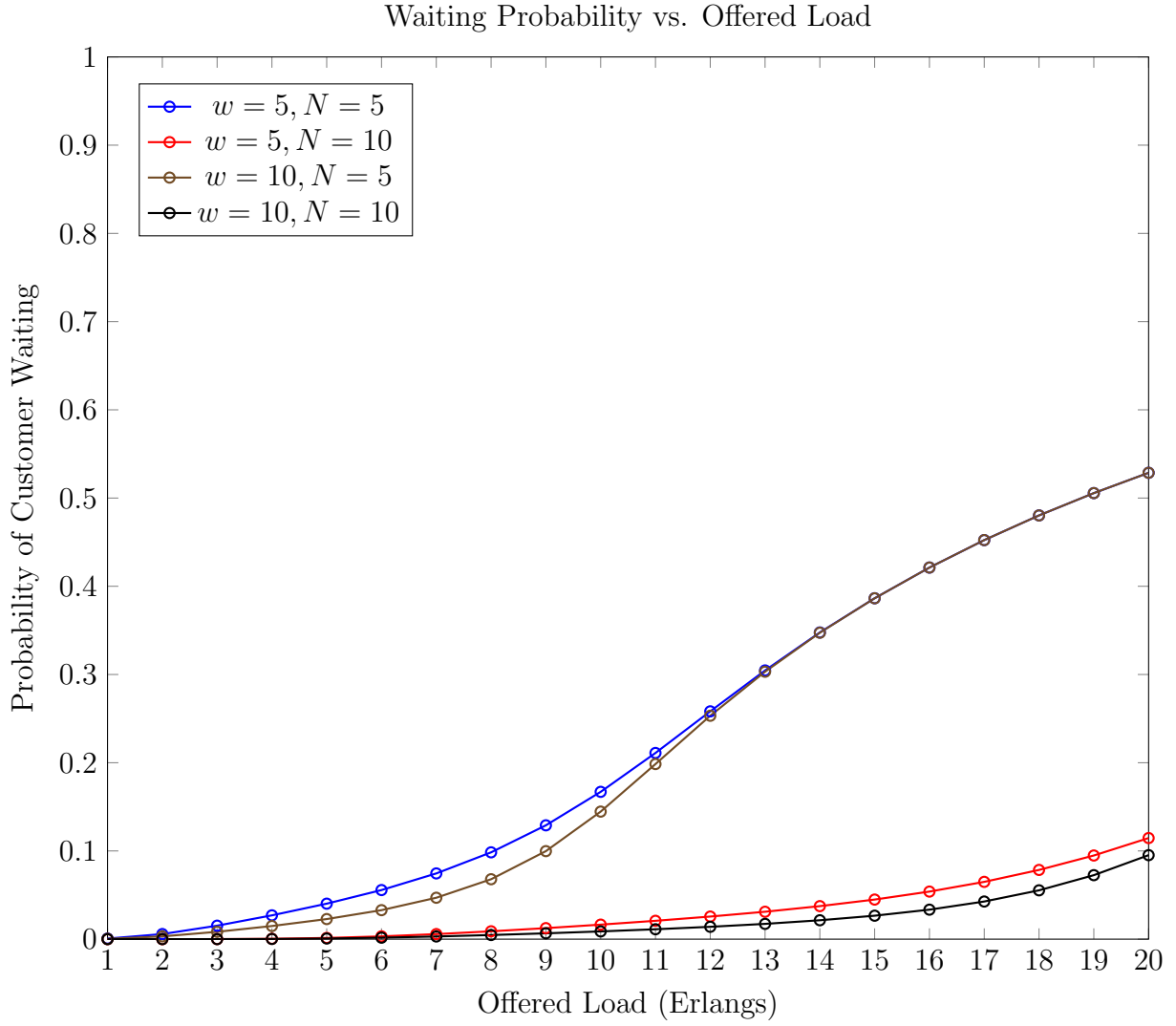


Figure 5: Experiment 4: Waiting Probability