COMPENG 4DK4 LAB1

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# Experiment

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| --- | --- | --- | --- | --- | --- |
| Service Time | Arrival Rate | Utilization | Fraction Served | Mean Number in system | Mean delay |
| 5 | 0.012357 | 0.061776 | 1.000000 | 0.063811 | 5.164663 |
| 5 | 0.024288 | 0.121424 | 1.000000 | 0.129816 | 5.345559 |
| 5 | 0.041819 | 0.209069 | 1.000000 | 0.236706 | 5.660967 |
| 5 | 0.062058 | 0.310251 | 1.000000 | 0.380048 | 6.124837 |
| 5 | 0.120962 | 0.604734 | 1.000000 | 1.067651 | 8.827442 |
| 5 | 0.133979 | 0.669813 | 1.000000 | 1.349778 | 10.075782 |
| 5 | 0.146497 | 0.732395 | 1.000000 | 1.735676 | 11.849313 |
| 5 | 0.147549 | 0.737654 | 1.000000 | 1.775807 | 12.036858 |
| 5 | 0.156446 | 0.782133 | 1.000000 | 2.187385 | 13.983462 |
| 5 | 0.174924 | 0.874510 | 1.000000 | 3.920923 | 22.417832 |
| 5 | 0.187101 | 0.935390 | 1.000000 | 7.693819 | 41.126253 |

Plot:



Justification:

As we obtained from the simulation plot, the mean delay axis intercept time at low arrival rate values (below 0.1 arrival rate) has a value around 6.0. As the arrival rate starts increasing and approaching the allowed maximum 0.2, we can obtain the plot is showing an exponential growth very fast when the arrival rate is over around 0.16 and approaching the infinity mean delay time where the vertical asymptote is 0.2.

This shape of the mean delay curve can reflect how the single server queue system handle customers under different arrival rates when the service time is constant (5). It can help better design the system by simulating the customers arrival rates to know the system capability. From this curve, we can find for this system, to allow customers have a low mean delay, the ideal arrival rate should lower than 0.16.