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TABLE OF THE WAITING TIME DISTRIBUTION
FOR THE CONSTANT SERVICE QUEUE (M/D/1)

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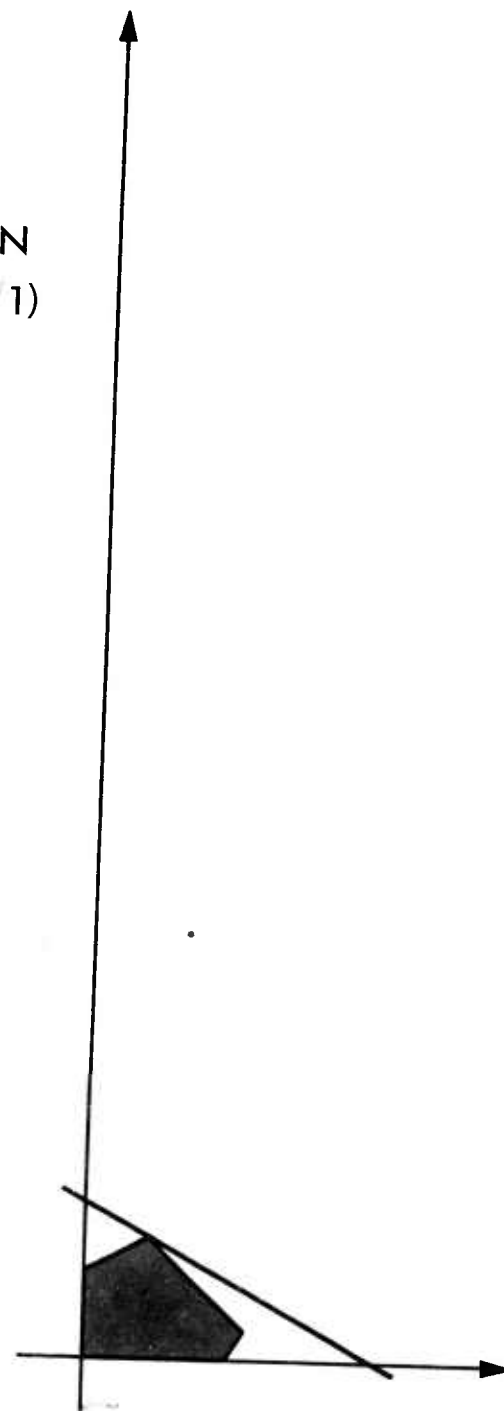
by

Robert M. Oliver
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University of California, Berkeley

OPERATIONS RESEARCH CENTER

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UNIVERSITY OF CALIFORNIA - BERKELEY



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TABLE OF THE WAITING TIME DISTRIBUTION
FOR THE CONSTANT SERVICE QUEUE (M/D/1)

1. Introduction

The single-channel constant service queue with Poisson arrivals represents one of a variety of mathematical models where customers demand service at a single facility. In this model it is assumed that the times between arrivals are exponentially distributed random variables and that the service or holding time of each customer is a constant Δ ; hence, a completion of service occurs every Δ time units when there are customers in the service facility. Tables of the probability distribution that the wait in queue is less than or equal to a given value have been computed.

There is an extensive list of publications covering the general theory of queues and the special cases of constant service times. The reader is referred to original papers on the constant service queue by Crommelin⁽¹⁾, Erlang⁽²⁾, Fry⁽³⁾, Khintchine⁽⁴⁾, and Pollaczek⁽⁵⁾.

2. Theoretical Considerations

Denote the wait (in queue) of two successive arrivals into a single service facility by the random variables x and y . Arrivals are served one at a time (in order of arrival) at constant intervals Δ when the service facility is busy; i.e., when there are a positive number of customers in the service facility. If the service facility is empty, an arrival has no wait in queue and immediately begins his constant service time. If the time between arrival of the first and second customer exceeds the wait in queue plus constant service time of the

first customer, $x + \Delta$, the wait of the second customer is $y = 0$. Otherwise, the wait of the second customer is $y = x + \Delta - u$, where u is the random inter-arrival time. The distribution of y is the distribution of the positive part of $x + \Delta - u$,

$$y = \text{Max} (0; x + \Delta - u). \quad u \geq 0 \quad (1)$$

If we assume that u has an average value λ^{-1} , and that, in equilibrium, $\text{Pr} \{x \leq t\} = \text{Pr} \{y \leq t\} = W(t)$, we obtain

$$\begin{aligned} W(t) &= \int_0^{\infty} \lambda e^{-\lambda u} W(t + u - \Delta) du & t \geq 0 \\ W(t) &= 0 & t < 0 \end{aligned} \quad (2)$$

Differentiation with respect to t and an integration by parts gives $W(t)$ as the solution of the differential-difference equation,

$$\frac{dW}{dt} = \lambda[W(t) - W(t - \Delta)] \quad t > 0 \quad (3)$$

In terms of its Laplace transform,

$$W^*(s) = \int_0^{\infty} e^{-st} W(t) dt = \frac{W(0^+)}{s - \lambda + \lambda e^{-s\Delta}} \quad (4)$$

The boundary condition at $t = 0$ is obtained by requiring that $W(t)$ be an honest probability distribution; i.e., that $W(t) \rightarrow 1$ as $t \rightarrow \infty$ and that

$$\lim_{s \rightarrow 0} s W^*(s) = 1 \quad (5)$$

From this limit we obtain the probability that a random arrival does not have to wait,

$$W(0^+) = 1 - \rho \quad (6)$$

where $\rho = \lambda \Delta$ is called the fractional utilization of the service system; the requirement for statistical equilibrium is that $\rho < 1$; i.e., that average arrival rate be less than the average service rate.

Inversion of the Laplace transform in (4) can be made in several ways. A partial fraction expansion of $W^*(s)$ gives

$$W(t) = 1 - \sum_k \alpha_k e^{\beta_k t} \quad (7)$$

where β_k ($\text{Re} \beta_k < 0$) are the distinct roots of

$$s - \lambda + \lambda e^{-s\Delta} = 0 \quad (8)$$

and

$$\alpha_k = (1 - \rho) (\rho e^{-\beta_k \Delta} - 1)^{-1}$$

An asymptotic expansion for $W_c(t) = 1 - W(t)$ can also be obtained in terms of the larger real root, z_0 , of

$$ze^{-z} = \rho e^{-\rho} \quad (9)$$

By substituting $z = \rho - s\Delta$ into Equation (4) we obtain

$$W^*(z) = \frac{\Delta (1 - \rho) e^{-z}}{\rho e^{-\rho} - ze^{-z}}$$

We now make use of the Laplace transform pairs

$$\begin{aligned} f(t) &\longleftrightarrow f^*(s) \\ b^{-1} e^{-at/b} f(t/b) &\longleftrightarrow f^*(a + bs) \end{aligned} \quad (10)$$

to obtain an asymptotic expansion for the probability $W_c(t)$ that the delay exceeds t ;

$$W_c(t) = 1 - W(t) \approx \frac{(1 - \rho)e^{(\rho - z_0)t/\Delta}}{z_0 - 1} . \quad (11)$$

Since $z_0 > 1$ for $\rho < 1$ the exponent is negative. This expression is surprisingly accurate for small values of t and ρ although our computing experience indicates that for values of $\rho > 0.90$ the root z_0 must be accurate to twice the number of decimals desired in $W_c(t)$. One can also expand the denominator of Equation (4) in powers of $\lambda e^{-s\Delta}/s - \lambda$ to get

$$W(t) = (1 - \rho) e^{\lambda t} \sum_{j=0}^{[t/\Delta]} \frac{(j\rho - \lambda t)^j}{j!} e^{-j\rho} \quad (12)$$

where $[x]$ denotes the integral part of x . Write $[t/\Delta] = n$, $(t/\Delta - [t/\Delta]) = \theta < 1$ and $\alpha = \rho e^{-\rho}$. In Equation (12) t is replaced by $n\Delta + \theta$ so that

$$W(t) = W_n(\theta) = (1 - \rho)e^{\rho(n+\theta)} \sum_{j=0}^n \frac{(\alpha(j - n - \theta))^j}{j!} \quad (13)$$

3. A Computing Algorithm

For integer n and $0 \leq \theta < 1$ we observe that both Equation (3) and (13) can be rewritten in the form

$$\begin{aligned} \frac{dW_0}{d\theta} &= \rho W_0(\theta) \quad ; \quad W_0(0^+) = 1 - \rho \\ \frac{dW_n}{d\theta} &= \rho[W_n(\theta) - W_{n-1}(\theta)] \end{aligned} \quad (14)$$

An integrating factor of Equation (14) is $e^{-\rho\theta}$. This can be used to show that the n^{th} derivative of $e^{-\rho\theta} W_n(\theta)$ is

$$\frac{d^n}{d\theta^n} [e^{-\rho\theta} W_n(\theta)] = (1 - \rho) (-\rho)^n \quad (15)$$

and hence that $e^{-\rho\theta} W_n(\theta)$ can be written as an n^{th} order polynomial in θ . In other words, $W_n(\theta)$ is of the form $e^{\rho\theta} [A_n \theta^n + A_{n-1} \theta^{n-1} + \dots + A_0]$ where A_j is independent of θ .

Equation (15) suggests a computing procedure which has been used to calculate $W(t)$. Define polynomials $C_n(k)$ independent of θ such that

$$W_n(\theta) = e^{\rho\theta} \sum_{k=0}^n C_n(k) (\rho\theta)^k. \quad (16)$$

We observe that $W_n(1) = W_{n+1}(0)$ and a binomial expansion of (13) in powers of θ gives

$$\begin{aligned} C_{n+1}(k) &= -\frac{1}{k} C_n(k-1) \\ C_{n+1}(0) &= e^{\rho} \sum_{k=0}^n C_n(k) \rho^k \end{aligned} \quad (17)$$

subject to the boundary condition $C_0^{(0)} = 1 - \rho$. The procedure of (16) and (17) has the desirable feature that the waiting time distribution for arguments equal to non-integral multiples of the service time can be expressed in terms of the function $W_{n+1}(0) = C_{n+1}^{(0)}$ evaluated at integral multiples of the constant service time.

The tables of the waiting time distribution are organized so that

columns correspond to values of utilization $0.00 \rightarrow 0.99$ (0.01) and rows correspond to values of the argument expressed as a multiple of the constant service time.

BIBLIOGRAPHY

1. Crommelin, C. D., "Delay Probability Formulae When the Holding Times are Constant," Post Office Electrical Engineers Journal, v. 25, 1932, pp. 41-50.
2. Brockmeyer, E., H. L. Halstrom, and A. Jensen, "The Life Works of A. K. Erlang," Translation, Dan. Acad. Tech. Sci. No. 2, 1948.
3. Fry, Thornton, C., Probability and Its Engineering Uses, Princeton, N. J., D. Van Nostrand, 1928.
4. Khintchine, A. Y., "Mathematical Methods in the Theory of Queuing; Translation, "Griffin's Statistical Monograph No. 7, New York: Hafner, 1960.
5. Pollaczek, Felix, "Problemes Stochastiques," Memorial des Sciences Mathematiques No. 136, Gauthier-Villars, Paris, 1957.

[illegible]

[illegible]

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	.30	.31	.32	.33	UTILIZATION					
					.34	.35	.36	.37	.38	.39
.00	.7000	.6900	.6800	.6700	.6600	.6500	.6400	.6300	.6200	.6100
.10	.7213	.7117	.7021	.6925	.6828	.6732	.6635	.6537	.6440	.6343
.20	.7433	.7341	.7249	.7157	.7064	.6971	.6878	.6784	.6690	.6595
.30	.7659	.7572	.7485	.7397	.7309	.7220	.7130	.7040	.6949	.6857
.40	.7892	.7811	.7729	.7645	.7562	.7477	.7391	.7305	.7218	.7130
.50	.8133	.8057	.7980	.7902	.7823	.7743	.7662	.7580	.7497	.7413
.60	.8381	.8311	.8239	.8167	.8094	.8019	.7943	.7866	.7788	.7708
.70	.8636	.8572	.8507	.8441	.8373	.8305	.8234	.8162	.8089	.8015
.80	.8899	.8842	.8784	.8724	.8663	.8600	.8536	.8470	.8403	.8334
.90	.9170	.9120	.9070	.9017	.8963	.8907	.8849	.8789	.8728	.8665
1.00	.9449	.9409	.9364	.9319	.9273	.9224	.9173	.9121	.9066	.9010
1.10	.9520	.9483	.9444	.9404	.9361	.9317	.9271	.9223	.9173	.9121
1.20	.9587	.9554	.9519	.9483	.9445	.9405	.9363	.9319	.9274	.9226
1.30	.9650	.9620	.9589	.9557	.9523	.9487	.9449	.9410	.9369	.9326
1.40	.9707	.9681	.9654	.9625	.9595	.9563	.9530	.9494	.9457	.9418
1.50	.9758	.9736	.9713	.9688	.9661	.9633	.9603	.9572	.9539	.9504
1.60	.9804	.9785	.9765	.9743	.9720	.9695	.9669	.9642	.9612	.9581
1.70	.9844	.9827	.9810	.9791	.9771	.9750	.9727	.9703	.9677	.9650
1.80	.9876	.9863	.9848	.9832	.9815	.9796	.9777	.9755	.9733	.9708
1.90	.9902	.9890	.9878	.9864	.9850	.9834	.9816	.9798	.9778	.9757
2.00	.9920	.9910	.9899	.9888	.9875	.9861	.9846	.9830	.9812	.9793
2.10	.9933	.9925	.9916	.9905	.9894	.9882	.9869	.9855	.9839	.9822
2.20	.9945	.9938	.9930	.9921	.9911	.9901	.9889	.9877	.9863	.9848
2.30	.9955	.9949	.9942	.9934	.9926	.9917	.9907	.9896	.9884	.9871
2.40	.9963	.9958	.9952	.9946	.9939	.9931	.9922	.9913	.9902	.9891
2.50	.9970	.9966	.9961	.9955	.9949	.9943	.9935	.9927	.9918	.9908
2.60	.9976	.9972	.9968	.9963	.9958	.9952	.9946	.9939	.9931	.9922
2.70	.9981	.9978	.9974	.9970	.9966	.9961	.9955	.9949	.9942	.9934
2.80	.9984	.9982	.9979	.9975	.9972	.9967	.9962	.9957	.9951	.9944
2.90	.9987	.9985	.9982	.9980	.9976	.9973	.9969	.9964	.9959	.9953
3.00	.9990	.9988	.9986	.9983	.9980	.9977	.9974	.9970	.9965	.9960
3.10	.9991	.9990	.9988	.9986	.9984	.9981	.9978	.9974	.9970	.9966
3.20	.9993	.9992	.9990	.9988	.9986	.9984	.9981	.9978	.9975	.9971
3.30	.9994	.9993	.9992	.9990	.9989	.9987	.9984	.9982	.9979	.9976
3.40	.9995	.9994	.9993	.9992	.9991	.9989	.9987	.9985	.9982	.9979
3.50	.9996	.9995	.9995	.9994	.9992	.9991	.9989	.9987	.9985	.9983
3.60	.9997	.9996	.9996	.9995	.9994	.9992	.9991	.9989	.9987	.9985
3.70	.9998	.9997	.9996	.9996	.9995	.9994	.9992	.9991	.9989	.9987
3.80	.9998	.9998	.9997	.9996	.9996	.9995	.9994	.9992	.9991	.9989
3.90	.9998	.9998	.9998	.9997	.9996	.9996	.9995	.9994	.9992	.9991
4.00	.9999	.9998	.9998	.9998	.9997	.9996	.9996	.9995	.9994	.9992
4.10		.9999	.9998	.9998	.9997	.9997	.9996	.9996	.9995	.9994
4.20			.9999	.9998	.9998	.9997	.9997	.9996	.9995	.9995
4.30				.9999	.9998	.9998	.9997	.9997	.9996	.9995
4.40					.9999	.9998	.9998	.9997	.9997	.9996
4.50						.9999	.9998	.9998	.9997	.9997
4.60							.9999	.9998	.9998	.9997
4.70								.9999	.9998	.9998
4.80									.9999	.9998
4.90										.9999
5.00										

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	.50	.51	.52	.53	UTILIZATION		.56	.57	.58	.59
	.54	.55								
.00	.5000	.4900	.4800	.4700	.4600	.4500	.4400	.4300	.4200	.4100
.20	.5526	.5426	.5326	.5226	.5125	.5023	.4921	.4819	.4717	.4614
.40	.6107	.6009	.5910	.5810	.5709	.5607	.5505	.5401	.5297	.5191
.60	.6749	.6654	.6558	.6460	.6360	.6259	.6157	.6053	.5948	.5841
.80	.7459	.7369	.7276	.7182	.7086	.6987	.6887	.6784	.6680	.6573
1.00	.8244	.8160	.8074	.7985	.7894	.7800	.7703	.7604	.7501	.7396
1.20	.8558	.8483	.8405	.8324	.8240	.8154	.8065	.7972	.7877	.7778
1.40	.8847	.8781	.8711	.8639	.8564	.8485	.8404	.8319	.8231	.8140
1.60	.9103	.9045	.8984	.8920	.8853	.8783	.8710	.8634	.8554	.8470
1.80	.9314	.9265	.9212	.9156	.9098	.9036	.8971	.8903	.8831	.8755
2.00	.9470	.9427	.9382	.9334	.9283	.9229	.9172	.9111	.9047	.8979
2.20	.9582	.9546	.9507	.9466	.9422	.9375	.9325	.9271	.9214	.9154
2.40	.9675	.9644	.9611	.9576	.9538	.9498	.9454	.9407	.9357	.9303
2.60	.9748	.9723	.9695	.9665	.9633	.9598	.9560	.9519	.9476	.9429
2.80	.9805	.9783	.9760	.9735	.9707	.9678	.9645	.9610	.9572	.9531
3.00	.9847	.9830	.9810	.9789	.9766	.9740	.9713	.9682	.9649	.9613
3.20	.9881	.9867	.9850	.9833	.9813	.9791	.9768	.9742	.9713	.9682
3.40	.9908	.9896	.9882	.9867	.9851	.9833	.9812	.9790	.9765	.9738
3.60	.9928	.9918	.9907	.9895	.9881	.9866	.9849	.9829	.9808	.9785
3.80	.9944	.9936	.9927	.9917	.9905	.9892	.9878	.9861	.9843	.9823
4.00	.9957	.9950	.9942	.9934	.9924	.9913	.9901	.9887	.9872	.9854
4.20	.9966	.9961	.9955	.9948	.9940	.9930	.9920	.9908	.9895	.9880
4.40	.9974	.9969	.9964	.9958	.9952	.9944	.9933	.9921	.9908	.9894
4.60	.9980	.9976	.9972	.9967	.9961	.9955	.9948	.9939	.9930	.9919
4.80	.9984	.9981	.9978	.9974	.9969	.9964	.9958	.9951	.9943	.9933
5.00	.9988	.9985	.9982	.9979	.9975	.9971	.9966	.9960	.9953	.9945
5.20	.9990	.9988	.9986	.9984	.9980	.9977	.9972	.9967	.9962	.9955
5.40	.9993	.9991	.9989	.9987	.9984	.9981	.9978	.9974	.9969	.9963
5.60	.9994	.9993	.9991	.9990	.9988	.9985	.9982	.9978	.9974	.9969
5.80	.9995	.9994	.9993	.9992	.9990	.9988	.9985	.9983	.9979	.9975
6.00	.9996	.9996	.9995	.9993	.9992	.9990	.9988	.9986	.9983	.9979
6.20	.9997	.9997	.9996	.9995	.9994	.9992	.9991	.9988	.9986	.9983
6.40	.9998	.9997	.9997	.9996	.9995	.9994	.9992	.9991	.9989	.9986
6.60	.9998	.9998	.9997	.9997	.9996	.9995	.9994	.9992	.9991	.9988
6.80	.9999	.9998	.9998	.9997	.9997	.9996	.9995	.9994	.9992	.9991
7.00		.9999	.9998	.9998	.9997	.9997	.9996	.9995	.9994	.9992
7.20			.9999	.9998	.9998	.9997	.9997	.9996	.9995	.9994
7.40				.9999	.9998	.9998	.9997	.9997	.9996	.9995
7.60					.9999	.9998	.9998	.9997	.9997	.9996
7.80						.9999	.9998	.9998	.9997	.9996
8.00							.9999	.9998	.9998	.9997
8.20								.9999	.9998	.9998
8.40									.9998	.9998
8.60									.9999	.9998
8.80										.9999
9.00										.9999
4.00										
5.00										
6.00										
7.00										
8.00										
9.00										

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	UTILIZATION									
	.60	.61	.62	.63	.64	.65	.66	.67	.68	.69
.00	.4000	.3900	.3800	.3700	.3600	.3500	.3400	.3300	.3200	.3100
.20	.4510	.4406	.4302	.4197	.4092	.3986	.3880	.3773	.3666	.3559
.40	.5085	.4978	.4870	.4760	.4650	.4539	.4427	.4314	.4200	.4085
.60	.5733	.5624	.5512	.5400	.5285	.5169	.5052	.4933	.4812	.4690
.80	.6464	.6353	.6240	.6125	.6007	.5887	.5765	.5640	.5513	.5384
1.00	.7288	.7178	.7064	.6947	.6827	.6704	.6578	.6449	.6316	.6181
1.20	.7677	.7571	.7463	.7351	.7236	.7117	.6994	.6868	.6738	.6604
1.40	.8045	.7947	.7844	.7739	.7629	.7515	.7397	.7275	.7148	.7017
1.60	.8383	.8292	.8197	.8097	.7994	.7886	.7774	.7657	.7535	.7409
1.80	.8676	.8592	.8505	.8413	.8317	.8216	.8110	.7999	.7883	.7762
2.00	.8907	.8832	.8752	.8667	.8578	.8485	.8386	.8282	.8173	.8058
2.20	.9089	.9021	.8949	.8872	.8790	.8704	.8612	.8515	.8413	.8305
2.40	.9246	.9185	.9120	.9050	.8976	.8897	.8813	.8723	.8628	.8526
2.60	.9378	.9323	.9265	.9202	.9135	.9063	.8986	.8903	.8815	.8721
2.80	.9486	.9438	.9386	.9329	.9269	.9203	.9133	.9058	.8976	.8889
3.00	.9574	.9531	.9485	.9435	.9380	.9321	.9258	.9189	.9114	.9034
3.20	.9647	.9610	.9569	.9524	.9475	.9422	.9365	.9302	.9234	.9160
3.40	.9708	.9675	.9639	.9600	.9556	.9509	.9457	.9400	.9338	.9270
3.60	.9759	.9730	.9698	.9663	.9625	.9582	.9535	.9484	.9428	.9366
3.80	.9800	.9775	.9747	.9717	.9682	.9644	.9602	.9556	.9505	.9449
4.00	.9835	.9813	.9789	.9761	.9731	.9697	.9660	.9618	.9572	.9521
4.20	.9863	.9844	.9823	.9799	.9772	.9743	.9709	.9672	.9630	.9583
4.40	.9887	.9871	.9852	.9831	.9807	.9781	.9751	.9718	.9680	.9638
4.60	.9906	.9892	.9876	.9858	.9837	.9814	.9787	.9757	.9723	.9685
4.80	.9923	.9910	.9896	.9880	.9862	.9841	.9818	.9791	.9761	.9727
5.00	.9936	.9925	.9913	.9899	.9883	.9865	.9844	.9820	.9793	.9762
5.20	.9947	.9938	.9927	.9915	.9901	.9885	.9867	.9845	.9821	.9793
5.40	.9956	.9948	.9939	.9929	.9916	.9902	.9886	.9867	.9845	.9820
5.60	.9964	.9957	.9949	.9940	.9929	.9917	.9902	.9886	.9866	.9844
5.80	.9970	.9964	.9957	.9949	.9940	.9929	.9917	.9902	.9884	.9864
6.00	.9975	.9970	.9964	.9957	.9949	.9940	.9929	.9915	.9900	.9882
6.20	.9979	.9975	.9970	.9964	.9957	.9949	.9939	.9927	.9914	.9898
6.40	.9983	.9979	.9975	.9970	.9964	.9956	.9948	.9937	.9925	.9911
6.60	.9986	.9983	.9979	.9975	.9969	.9963	.9955	.9946	.9935	.9923
6.80	.9988	.9986	.9983	.9979	.9974	.9968	.9962	.9954	.9944	.9933
7.00	.9990	.9988	.9985	.9982	.9978	.9973	.9967	.9960	.9952	.9942
7.20	.9992	.9990	.9988	.9985	.9981	.9977	.9972	.9966	.9958	.9949
7.40	.9993	.9992	.9990	.9987	.9984	.9981	.9976	.9971	.9964	.9956
7.60	.9995	.9993	.9991	.9989	.9987	.9983	.9980	.9975	.9969	.9962
7.80	.9995	.9994	.9993	.9991	.9989	.9986	.9982	.9978	.9973	.9967
8.00	.9996	.9995	.9994	.9992	.9990	.9988	.9985	.9981	.9977	.9971
8.20	.9997	.9996	.9995	.9994	.9992	.9990	.9987	.9984	.9980	.9975
8.40	.9997	.9997	.9996	.9995	.9993	.9991	.9989	.9986	.9983	.9978
8.60	.9998	.9997	.9996	.9995	.9994	.9993	.9991	.9988	.9985	.9981
8.80	.9998	.9998	.9997	.9996	.9995	.9994	.9992	.9990	.9987	.9983
9.00	.9999	.9998	.9998	.9997	.9996	.9995	.9993	.9991	.9989	.9986
9.20		.9998	.9998	.9997	.9996	.9995	.9994	.9992	.9990	.9988
9.40		.9999	.9998	.9998	.9997	.9996	.9995	.9993	.9992	.9989
9.60			.9999	.9998	.9997	.9997	.9996	.9994	.9993	.9991
9.80				.9998	.9998	.9997	.9996	.9995	.9994	.9992
10.00				.9999	.9998	.9998	.9997	.9996	.9995	.9993

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	UTILIZATION									
	.70	.71	.72	.73	.74	.75	.76	.77	.78	.79
.00	.3000	.2900	.2800	.2700	.2600	.2500	.2400	.2300	.2200	.2100
.20	.3451	.3342	.3234	.3124	.3015	.2905	.2794	.2683	.2571	.2459
.40	.3969	.3852	.3735	.3616	.3496	.3375	.3253	.3130	.3006	.2880
.60	.4566	.4440	.4313	.4184	.4053	.3921	.3787	.3651	.3513	.3373
.80	.5252	.5118	.4981	.4842	.4700	.4555	.4408	.4258	.4106	.3951
1.00	.6041	.5899	.5752	.5603	.5449	.5293	.5132	.4967	.4799	.4627
1.20	.6466	.6324	.6178	.6027	.5873	.5713	.5550	.5381	.5208	.5031
1.40	.6882	.6742	.6597	.6447	.6292	.6132	.5966	.5795	.5619	.5437
1.60	.7277	.7140	.6997	.6849	.6696	.6536	.6370	.6198	.6019	.5834
1.80	.7635	.7503	.7364	.7219	.7068	.6910	.6746	.6574	.6395	.6208
2.00	.7937	.7810	.7676	.7536	.7389	.7235	.7073	.6904	.6726	.6540
2.20	.8190	.8070	.7942	.7807	.7666	.7516	.7358	.7192	.7018	.6834
2.40	.8419	.8305	.8183	.8055	.7919	.7775	.7622	.7460	.7289	.7109
2.60	.8620	.8513	.8399	.8277	.8147	.8008	.7861	.7705	.7538	.7362
2.80	.8795	.8695	.8587	.8472	.8349	.8217	.8075	.7925	.7763	.7591
3.00	.8947	.8853	.8752	.8644	.8527	.8402	.8267	.8122	.7966	.7800
3.20	.9080	.8993	.8899	.8797	.8687	.8568	.8439	.8301	.8152	.7991
3.40	.9196	.9116	.9028	.8933	.8830	.8717	.8596	.8463	.8320	.8165
3.60	.9298	.9224	.9142	.9054	.8957	.8851	.8736	.8610	.8474	.8325
3.80	.9387	.9318	.9243	.9161	.9070	.8971	.8862	.8743	.8613	.8470
4.00	.9464	.9401	.9332	.9255	.9171	.9078	.8976	.8863	.8739	.8603
4.20	.9532	.9474	.9410	.9340	.9261	.9174	.9078	.8971	.8854	.8724
4.40	.9591	.9538	.9480	.9414	.9341	.9260	.9170	.9070	.8959	.8835
4.60	.9643	.9595	.9541	.9480	.9413	.9337	.9253	.9159	.9053	.8936
4.80	.9688	.9644	.9595	.9539	.9477	.9406	.9327	.9239	.9140	.9029
5.00	.9727	.9687	.9642	.9591	.9533	.9468	.9395	.9312	.9218	.9113
5.20	.9762	.9726	.9684	.9637	.9584	.9524	.9455	.9377	.9289	.9190
5.40	.9792	.9759	.9721	.9678	.9629	.9573	.9509	.9437	.9354	.9260
5.60	.9818	.9788	.9754	.9715	.9670	.9618	.9558	.9491	.9413	.9325
5.80	.9841	.9814	.9783	.9747	.9705	.9658	.9602	.9539	.9467	.9383
6.00	.9861	.9837	.9808	.9776	.9737	.9693	.9642	.9583	.9515	.9437
6.20	.9879	.9857	.9831	.9801	.9766	.9725	.9678	.9623	.9559	.9486
6.40	.9894	.9874	.9851	.9823	.9791	.9754	.9710	.9659	.9600	.9530
6.60	.9907	.9890	.9868	.9843	.9814	.9779	.9739	.9692	.9636	.9571
6.80	.9919	.9903	.9884	.9861	.9834	.9802	.9765	.9721	.9669	.9608
7.00	.9929	.9915	.9897	.9877	.9852	.9823	.9788	.9748	.9699	.9642
7.20	.9938	.9925	.9909	.9891	.9868	.9841	.9810	.9772	.9727	.9674
7.40	.9946	.9934	.9920	.9903	.9883	.9858	.9829	.9794	.9752	.9702
7.60	.9953	.9942	.9929	.9914	.9895	.9873	.9846	.9813	.9774	.9728
7.80	.9959	.9949	.9938	.9924	.9907	.9886	.9861	.9831	.9795	.9751
8.00	.9964	.9956	.9945	.9932	.9917	.9898	.9875	.9847	.9814	.9773
8.20	.9969	.9961	.9952	.9940	.9926	.9909	.9887	.9862	.9831	.9793
8.40	.9973	.9966	.9957	.9947	.9934	.9918	.9899	.9875	.9846	.9811
8.60	.9976	.9970	.9962	.9953	.9941	.9927	.9909	.9887	.9860	.9827
8.80	.9979	.9974	.9967	.9958	.9947	.9934	.9918	.9898	.9873	.9842
9.00	.9982	.9977	.9971	.9963	.9953	.9941	.9926	.9907	.9884	.9856
9.20	.9984	.9980	.9974	.9967	.9958	.9947	.9933	.9916	.9895	.9868
9.40	.9986	.9982	.9977	.9971	.9963	.9953	.9940	.9924	.9905	.9880
9.60	.9988	.9984	.9980	.9974	.9967	.9958	.9946	.9932	.9913	.9890
9.80	.9989	.9986	.9982	.9977	.9970	.9962	.9951	.9938	.9921	.9900

[illegible]

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	UTILIZATION									
	.80	.81	.82	.83	.84	.85	.86	.87	.88	.89
.00	.2000	.1900	.1800	.1700	.1600	.1500	.1400	.1300	.1200	.1100
.20	.2347	.2234	.2121	.2007	.1893	.1778	.1663	.1547	.1431	.1314
.40	.2754	.2627	.2499	.2369	.2239	.2107	.1975	.1841	.1706	.1570
.60	.3232	.3089	.2944	.2797	.2649	.2498	.2345	.2191	.2035	.1876
.80	.3793	.3632	.3469	.3302	.3133	.2961	.2786	.2607	.2426	.2242
1.00	.4451	.4271	.4087	.3899	.3706	.3509	.3308	.3103	.2893	.2679
1.20	.4848	.4660	.4467	.4269	.4066	.3858	.3643	.3424	.3198	.2967
1.40	.5248	.5054	.4854	.4647	.4434	.4214	.3987	.3754	.3513	.3265
1.60	.5642	.5443	.5236	.5022	.4800	.4570	.4332	.4086	.3831	.3567
1.80	.6014	.5811	.5600	.5381	.5152	.4914	.4666	.4409	.4141	.3863
2.00	.6345	.6141	.5928	.5705	.5472	.5228	.4973	.4707	.4429	.4139
2.20	.6640	.6437	.6223	.5999	.5763	.5515	.5255	.4982	.4696	.4396
2.40	.6918	.6716	.6503	.6278	.6041	.5790	.5526	.5248	.4955	.4647
2.60	.7174	.6975	.6763	.6539	.6302	.6050	.5784	.5502	.5203	.4887
2.80	.7408	.7212	.7004	.6781	.6545	.6293	.6025	.5741	.5438	.5117
3.00	.7621	.7430	.7225	.7005	.6771	.6520	.6252	.5966	.5660	.5334
3.20	.7817	.7631	.7430	.7214	.6982	.6733	.6466	.6179	.5872	.5543
3.40	.7998	.7816	.7620	.7409	.7180	.6934	.6668	.6382	.6074	.5742
3.60	.8163	.7987	.7797	.7590	.7365	.7122	.6859	.6574	.6266	.5933
3.80	.8315	.8145	.7960	.7758	.7538	.7299	.7039	.6756	.6448	.6114
4.00	.8454	.8290	.8111	.7914	.7699	.7465	.7208	.6928	.6622	.6288
4.20	.8581	.8424	.8251	.8060	.7850	.7620	.7368	.7090	.6787	.6454
4.40	.8699	.8547	.8380	.8195	.7991	.7766	.7518	.7245	.6944	.6613
4.60	.8806	.8661	.8500	.8321	.8123	.7903	.7660	.7391	.7093	.6764
4.80	.8905	.8766	.8611	.8439	.8246	.8032	.7794	.7529	.7235	.6909
5.00	.8995	.8863	.8714	.8547	.8361	.8153	.7920	.7660	.7370	.7047
5.20	.9078	.8952	.8809	.8649	.8469	.8266	.8039	.7784	.7499	.7179
5.40	.9154	.9034	.8897	.8743	.8569	.8373	.8151	.7902	.7621	.7305
5.60	.9224	.9109	.8979	.8831	.8663	.8472	.8257	.8013	.7737	.7426
5.80	.9288	.9179	.9055	.8913	.8751	.8566	.8356	.8118	.7848	.7541
6.00	.9347	.9243	.9125	.8988	.8833	.8654	.8450	.8218	.7953	.7651
6.20	.9401	.9303	.9189	.9059	.8909	.8737	.8539	.8312	.8053	.7756
6.40	.9450	.9357	.9249	.9125	.8981	.8814	.8623	.8402	.8148	.7856
6.60	.9496	.9407	.9305	.9186	.9047	.8887	.8701	.8487	.8238	.7952
6.80	.9537	.9454	.9356	.9243	.9110	.8955	.8776	.8567	.8324	.8044
7.00	.9575	.9497	.9404	.9295	.9168	.9020	.8846	.8643	.8406	.8131
7.20	.9611	.9536	.9448	.9345	.9223	.9080	.8912	.8715	.8484	.8215
7.40	.9643	.9572	.9489	.9390	.9274	.9136	.8974	.8783	.8558	.8294
7.60	.9672	.9606	.9527	.9433	.9321	.9189	.9033	.8847	.8629	.8371
7.80	.9699	.9637	.9562	.9473	.9366	.9239	.9088	.8909	.8696	.8444
8.00	.9724	.9665	.9594	.9509	.9408	.9286	.9140	.8966	.8759	.8513
8.20	.9747	.9691	.9624	.9544	.9446	.9330	.9189	.9021	.8820	.8580
8.40	.9768	.9716	.9652	.9575	.9483	.9371	.9236	.9073	.8878	.8643
8.60	.9787	.9738	.9678	.9605	.9517	.9409	.9279	.9122	.8932	.8704
8.80	.9805	.9758	.9702	.9633	.9548	.9446	.9321	.9169	.8985	.8762
9.00	.9821	.9777	.9724	.9658	.9578	.9480	.9359	.9213	.9034	.8817
9.20	.9835	.9795	.9744	.9682	.9606	.9512	.9396	.9255	.9081	.8870
9.40	.9849	.9811	.9763	.9704	.9631	.9541	.9431	.9294	.9126	.8920
9.60	.9862	.9826	.9781	.9725	.9656	.9570	.9463	.9331	.9169	.8969
9.80	.9873	.9839	.9797	.9744	.9678	.9596	.9494	.9367	.9210	.9015

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	UTILIZATION									
	.80	.81	.82	.83	.84	.85	.86	.87	.88	.89
20.00	.9998	.9997	.9996	.9994	.9990	.9984	.9975	.9961	.9939	.9904
20.20	.9999	.9998	.9996	.9994	.9991	.9985	.9976	.9963	.9942	.9909
20.40	.9999	.9998	.9997	.9994	.9991	.9986	.9978	.9965	.9944	.9913
20.60	.9999	.9998	.9997	.9995	.9992	.9987	.9979	.9967	.9947	.9917
20.80	.9999	.9998	.9997	.9995	.9992	.9988	.9980	.9968	.9950	.9920
21.00		.9998	.9997	.9996	.9993	.9988	.9981	.9970	.9952	.9924
21.20		.9998	.9997	.9996	.9993	.9989	.9982	.9972	.9955	.9927
21.40		.9999	.9998	.9996	.9994	.9990	.9983	.9973	.9957	.9931
21.60		.9999	.9998	.9996	.9994	.9990	.9984	.9975	.9959	.9934
21.80		.9999	.9998	.9997	.9995	.9991	.9985	.9976	.9961	.9937
22.00			.9998	.9997	.9995	.9992	.9986	.9977	.9963	.9940
22.20			.9998	.9997	.9995	.9992	.9987	.9978	.9965	.9942
22.40			.9998	.9997	.9996	.9993	.9988	.9980	.9966	.9945
22.60			.9999	.9998	.9996	.9993	.9988	.9981	.9968	.9947
22.80			.9999	.9998	.9996	.9993	.9989	.9982	.9970	.9950
23.00			.9999	.9998	.9996	.9994	.9990	.9983	.9971	.9952
23.20			.9999	.9998	.9997	.9994	.9990	.9984	.9972	.9954
23.40			.9999	.9998	.9997	.9995	.9991	.9984	.9974	.9956
23.60			.9999	.9998	.9997	.9995	.9991	.9985	.9975	.9958
23.80			.9999	.9998	.9997	.9995	.9992	.9986	.9976	.9960
24.00				.9998	.9997	.9995	.9992	.9987	.9977	.9962
24.20				.9999	.9998	.9996	.9993	.9987	.9979	.9963
24.40				.9999	.9998	.9996	.9993	.9988	.9980	.9965
24.60				.9999	.9998	.9996	.9994	.9989	.9981	.9967
24.80				.9999	.9998	.9997	.9994	.9989	.9982	.9968
25.00					.9998	.9997	.9994	.9990	.9982	.9970
25.20					.9998	.9997	.9995	.9990	.9983	.9971
25.40					.9998	.9997	.9995	.9991	.9984	.9972
25.60					.9998	.9997	.9995	.9991	.9985	.9973
25.80					.9999	.9997	.9995	.9992	.9986	.9975
26.00					.9999	.9998	.9996	.9992	.9986	.9976
26.20					.9999	.9998	.9996	.9993	.9987	.9977
26.40					.9999	.9998	.9996	.9993	.9988	.9978
26.60					.9999	.9998	.9996	.9993	.9988	.9979
26.80					.9999	.9998	.9997	.9994	.9989	.9980
27.00						.9998	.9997	.9994	.9989	.9981
27.20						.9998	.9997	.9994	.9990	.9982
27.40						.9998	.9997	.9995	.9990	.9982
27.60						.9999	.9997	.9995	.9991	.9983
27.80						.9999	.9997	.9995	.9991	.9984
28.00						.9999	.9998	.9996	.9992	.9985
28.20						.9999	.9998	.9996	.9992	.9985
28.40						.9999	.9998	.9996	.9993	.9986
28.60						.9999	.9998	.9996	.9993	.9987
28.80						.9999	.9998	.9996	.9993	.9987
29.00							.9998	.9997	.9994	.9988
29.20							.9998	.9997	.9994	.9988
29.40							.9998	.9997	.9994	.9989
29.60							.9999	.9997	.9994	.9989
29.80							.9999	.9997	.9995	.9990
30.00							.9999	.9997	.9995	.9990

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	UTILIZATION									
	.80	.81	.82	.83	.84	.85	.86	.87	.88	.89
10.00	.9883	.9852	.9812	.9762	.9699	.9621	.9523	.9400	.9248	.9059
10.20	.9893	.9863	.9826	.9779	.9719	.9644	.9550	.9432	.9285	.9101
10.40	.9902	.9874	.9839	.9794	.9737	.9666	.9576	.9462	.9320	.9141
10.60	.9910	.9884	.9851	.9808	.9755	.9686	.9600	.9491	.9353	.9180
10.80	.9917	.9893	.9862	.9822	.9771	.9706	.9623	.9518	.9385	.9216
11.00	.9924	.9901	.9872	.9834	.9786	.9724	.9644	.9543	.9415	.9251
11.20	.9930	.9909	.9882	.9846	.9800	.9741	.9665	.9568	.9443	.9285
11.40	.9936	.9916	.9890	.9857	.9813	.9757	.9684	.9591	.9471	.9317
11.60	.9941	.9923	.9898	.9867	.9825	.9772	.9702	.9612	.9496	.9347
11.80	.9946	.9929	.9906	.9876	.9837	.9786	.9719	.9633	.9521	.9376
12.00	.9951	.9934	.9913	.9885	.9847	.9799	.9735	.9652	.9544	.9404
12.20	.9955	.9940	.9919	.9893	.9857	.9811	.9750	.9671	.9567	.9431
12.40	.9959	.9944	.9925	.9900	.9867	.9823	.9765	.9688	.9588	.9456
12.60	.9962	.9949	.9931	.9907	.9875	.9834	.9778	.9705	.9608	.9481
12.80	.9965	.9953	.9936	.9914	.9884	.9844	.9791	.9720	.9627	.9504
13.00	.9968	.9956	.9941	.9920	.9891	.9853	.9803	.9735	.9645	.9526
13.20	.9971	.9960	.9945	.9925	.9898	.9862	.9814	.9749	.9663	.9547
13.40	.9973	.9963	.9949	.9930	.9905	.9871	.9825	.9763	.9679	.9568
13.60	.9975	.9966	.9953	.9935	.9911	.9879	.9835	.9775	.9695	.9587
13.80	.9977	.9969	.9956	.9940	.9917	.9886	.9844	.9787	.9710	.9605
14.00	.9979	.9971	.9960	.9944	.9923	.9893	.9853	.9798	.9724	.9623
14.20	.9981	.9973	.9963	.9948	.9928	.9900	.9861	.9809	.9737	.9640
14.40	.9982	.9975	.9965	.9952	.9932	.9906	.9869	.9819	.9750	.9656
14.60	.9984	.9977	.9968	.9955	.9937	.9912	.9877	.9829	.9762	.9671
14.80	.9985	.9979	.9970	.9958	.9941	.9917	.9884	.9838	.9774	.9686
15.00	.9986	.9981	.9973	.9961	.9945	.9922	.9891	.9846	.9785	.9700
15.20	.9988	.9982	.9975	.9964	.9948	.9927	.9897	.9855	.9796	.9714
15.40	.9989	.9984	.9976	.9966	.9952	.9931	.9903	.9862	.9806	.9726
15.60	.9990	.9985	.9978	.9969	.9955	.9936	.9908	.9870	.9815	.9739
15.80	.9990	.9986	.9980	.9971	.9958	.9940	.9913	.9876	.9824	.9750
16.00	.9991	.9987	.9981	.9973	.9961	.9943	.9918	.9883	.9833	.9761
16.20	.9992	.9988	.9983	.9975	.9963	.9947	.9923	.9889	.9841	.9772
16.40	.9993	.9989	.9984	.9977	.9966	.9950	.9927	.9895	.9849	.9782
16.60	.9993	.9990	.9985	.9978	.9968	.9953	.9932	.9901	.9856	.9792
16.80	.9994	.9991	.9986	.9980	.9970	.9956	.9936	.9906	.9863	.9801
17.00	.9994	.9991	.9987	.9981	.9972	.9959	.9939	.9911	.9870	.9810
17.20	.9995	.9992	.9988	.9982	.9974	.9961	.9943	.9916	.9876	.9819
17.40	.9995	.9993	.9989	.9984	.9976	.9964	.9946	.9920	.9882	.9827
17.60	.9996	.9993	.9990	.9985	.9977	.9966	.9949	.9924	.9888	.9835
17.80	.9996	.9994	.9991	.9986	.9979	.9968	.9952	.9928	.9893	.9842
18.00	.9996	.9994	.9991	.9987	.9980	.9970	.9955	.9932	.9899	.9849
18.20	.9997	.9995	.9992	.9988	.9981	.9972	.9957	.9936	.9904	.9856
18.40	.9997	.9995	.9993	.9989	.9983	.9973	.9960	.9939	.9908	.9862
18.60	.9997	.9996	.9993	.9989	.9984	.9975	.9962	.9942	.9913	.9868
18.80	.9997	.9996	.9994	.9990	.9985	.9977	.9964	.9945	.9917	.9874
19.00	.9998	.9996	.9994	.9991	.9986	.9978	.9966	.9948	.9921	.9880
19.20	.9998	.9997	.9995	.9991	.9987	.9979	.9968	.9951	.9925	.9885
19.40	.9998	.9997	.9995	.9992	.9988	.9981	.9970	.9954	.9929	.9890
19.60	.9998	.9997	.9995	.9993	.9988	.9982	.9972	.9956	.9932	.9895
19.80	.9998	.9997	.9996	.9993	.9989	.9983	.9973	.9958	.9935	.9900

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	UTILIZATION									
	.90	.91	.92	.93	.94	.95	.96	.97	.98	.99
.00	.1000	.0900	.0800	.0700	.0600	.0500	.0400	.0300	.0200	.0100
.20	.1197	.1080	.0962	.0843	.0724	.0605	.0485	.0364	.0243	.0122
.40	.1433	.1295	.1156	.1015	.0874	.0731	.0587	.0442	.0296	.0149
.60	.1716	.1554	.1389	.1223	.1055	.0884	.0712	.0537	.0360	.0181
.80	.2054	.1864	.1670	.1473	.1273	.1069	.0862	.0652	.0438	.0221
1.00	.2460	.2236	.2007	.1774	.1536	.1293	.1045	.0791	.0533	.0269
1.20	.2729	.2486	.2236	.1980	.1718	.1449	.1173	.0890	.0601	.0304
1.40	.3009	.2746	.2475	.2196	.1909	.1613	.1308	.0995	.0673	.0341
1.60	.3294	.3012	.2719	.2417	.2105	.1782	.1449	.1104	.0748	.0380
1.80	.3574	.3274	.2961	.2637	.2301	.1952	.1590	.1214	.0824	.0419
2.00	.3836	.3520	.3190	.2847	.2488	.2115	.1725	.1320	.0898	.0458
2.20	.4082	.3752	.3407	.3046	.2667	.2271	.1857	.1423	.0970	.0496
2.40	.4322	.3980	.3621	.3242	.2845	.2427	.1988	.1526	.1042	.0534
2.60	.4554	.4201	.3828	.3434	.3019	.2580	.2117	.1629	.1114	.0572
2.80	.4775	.4413	.4028	.3620	.3188	.2730	.2244	.1730	.1186	.0609
3.00	.4987	.4616	.4221	.3800	.3352	.2876	.2369	.1829	.1256	.0647
3.20	.5190	.4812	.4408	.3975	.3513	.3019	.2491	.1928	.1326	.0684
3.40	.5385	.5001	.4589	.4146	.3670	.3160	.2612	.2025	.1396	.0722
3.60	.5573	.5184	.4764	.4312	.3824	.3298	.2731	.2121	.1465	.0759
3.80	.5752	.5359	.4934	.4472	.3973	.3433	.2848	.2216	.1533	.0796
4.00	.5925	.5529	.5098	.4629	.4119	.3565	.2963	.2310	.1601	.0833
4.20	.6090	.5692	.5256	.4781	.4261	.3694	.3076	.2403	.1669	.0870
4.40	.6249	.5849	.5410	.4928	.4400	.3821	.3188	.2494	.1735	.0906
4.60	.6401	.6000	.5558	.5072	.4536	.3946	.3297	.2585	.1802	.0943
4.80	.6547	.6146	.5702	.5211	.4668	.4068	.3405	.2674	.1868	.0979
5.00	.6687	.6287	.5841	.5346	.4797	.4187	.3511	.2762	.1933	.1015
5.20	.6822	.6422	.5976	.5478	.4923	.4304	.3616	.2849	.1997	.1051
5.40	.6951	.6552	.6106	.5606	.5046	.4419	.3718	.2936	.2062	.1087
5.60	.7074	.6678	.6232	.5730	.5166	.4531	.3819	.3021	.2125	.1122
5.80	.7193	.6799	.6354	.5851	.5283	.4642	.3919	.3105	.2189	.1158
6.00	.7307	.6916	.6472	.5968	.5397	.4749	.4017	.3188	.2251	.1193
6.20	.7416	.7029	.6586	.6082	.5508	.4855	.4113	.3270	.2313	.1229
6.40	.7521	.7137	.6697	.6193	.5617	.4959	.4208	.3351	.2375	.1264
6.60	.7622	.7241	.6804	.6301	.5723	.5060	.4301	.3431	.2436	.1299
6.80	.7718	.7342	.6907	.6405	.5827	.5160	.4393	.3510	.2497	.1334
7.00	.7811	.7439	.7007	.6507	.5928	.5257	.4483	.3588	.2557	.1368
7.20	.7900	.7532	.7104	.6606	.6026	.5353	.4571	.3666	.2617	.1403
7.40	.7985	.7622	.7198	.6702	.6122	.5446	.4659	.3742	.2676	.1437
7.60	.8067	.7709	.7289	.6795	.6216	.5538	.4745	.3817	.2735	.1472
7.80	.8145	.7793	.7376	.6886	.6308	.5628	.4829	.3892	.2793	.1506
8.00	.8220	.7873	.7461	.6974	.6397	.5716	.4913	.3966	.2851	.1540
8.20	.8293	.7951	.7543	.7059	.6484	.5802	.4994	.4038	.2908	.1574
8.40	.8362	.8025	.7623	.7142	.6569	.5887	.5075	.4110	.2965	.1608
8.60	.8428	.8097	.7700	.7223	.6652	.5970	.5154	.4181	.3021	.1641
8.80	.8492	.8167	.7774	.7302	.6733	.6051	.5232	.4251	.3077	.1675
9.00	.8553	.8234	.7846	.7378	.6812	.6130	.5309	.4320	.3133	.1708
9.20	.8612	.8298	.7916	.7452	.6890	.6208	.5384	.4389	.3188	.1741
9.40	.8668	.8360	.7983	.7524	.6965	.6285	.5459	.4456	.3243	.1774
9.60	.8722	.8420	.8049	.7594	.7038	.6359	.5532	.4523	.3297	.1807
9.80	.8774	.8477	.8112	.7662	.7110	.6433	.5603	.4589	.3351	.1840

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	UTILIZATION									
	.90	.91	.92	.93	.94	.95	.96	.97	.98	.99
10.00	.8824	.8533	.8173	.7728	.7180	.6505	.5674	.4654	.3404	.1873
10.20	.8872	.8587	.8232	.7793	.7248	.6575	.5744	.4719	.3457	.1905
10.40	.8918	.8638	.8289	.7855	.7315	.6644	.5812	.4783	.3509	.1938
10.60	.8961	.8688	.8345	.7916	.7380	.6712	.5880	.4845	.3561	.1970
10.80	.9004	.8736	.8398	.7975	.7443	.6778	.5946	.4907	.3613	.2002
11.00	.9044	.8782	.8450	.8032	.7505	.6843	.6011	.4969	.3664	.2034
11.20	.9083	.8826	.8500	.8088	.7565	.6906	.6075	.5029	.3715	.2066
11.40	.9120	.8869	.8549	.8142	.7624	.6969	.6138	.5089	.3766	.2098
11.60	.9156	.8910	.8596	.8194	.7682	.7030	.6201	.5149	.3816	.2130
11.80	.9190	.8950	.8641	.8245	.7738	.7089	.6262	.5207	.3865	.2161
12.00	.9223	.8988	.8685	.8295	.7793	.7148	.6322	.5265	.3914	.2192
12.20	.9254	.9025	.8728	.8343	.7846	.7206	.6381	.5322	.3963	.2224
12.40	.9285	.9061	.8769	.8390	.7898	.7262	.6439	.5378	.4012	.2255
12.60	.9314	.9095	.8809	.8435	.7949	.7317	.6497	.5434	.4060	.2286
12.80	.9342	.9128	.8847	.8480	.7999	.7371	.6553	.5489	.4107	.2317
13.00	.9368	.9160	.8885	.8523	.8047	.7424	.6608	.5543	.4155	.2348
13.20	.9394	.9190	.8921	.8564	.8094	.7476	.6663	.5597	.4202	.2378
13.40	.9419	.9220	.8956	.8605	.8141	.7527	.6717	.5650	.4248	.2409
13.60	.9442	.9248	.8990	.8644	.8186	.7576	.6769	.5702	.4294	.2439
13.80	.9465	.9276	.9022	.8683	.8230	.7625	.6821	.5754	.4340	.2469
14.00	.9486	.9302	.9054	.8720	.8272	.7673	.6873	.5805	.4385	.2500
14.20	.9507	.9328	.9084	.8756	.8314	.7720	.6923	.5856	.4430	.2530
14.40	.9527	.9352	.9114	.8791	.8355	.7766	.6972	.5906	.4475	.2560
14.60	.9547	.9376	.9143	.8826	.8395	.7811	.7021	.5955	.4519	.2589
14.80	.9565	.9399	.9171	.8859	.8434	.7855	.7069	.6004	.4563	.2619
15.00	.9583	.9420	.9197	.8891	.8472	.7898	.7116	.6052	.4607	.2649
15.20	.9600	.9442	.9223	.8922	.8509	.7940	.7163	.6100	.4650	.2678
15.40	.9616	.9462	.9248	.8953	.8545	.7982	.7208	.6147	.4693	.2707
15.60	.9631	.9482	.9273	.8983	.8580	.8023	.7253	.6193	.4736	.2737
15.80	.9646	.9500	.9296	.9011	.8614	.8062	.7297	.6239	.4778	.2766
16.00	.9661	.9519	.9319	.9039	.8648	.8101	.7341	.6284	.4820	.2795
16.20	.9674	.9536	.9341	.9066	.8681	.8140	.7384	.6329	.4861	.2824
16.40	.9688	.9553	.9362	.9093	.8712	.8177	.7426	.6373	.4903	.2852
16.60	.9700	.9569	.9383	.9118	.8744	.8214	.7467	.6417	.4943	.2881
16.80	.9712	.9585	.9403	.9143	.8774	.8250	.7508	.6460	.4984	.2909
17.00	.9724	.9600	.9422	.9168	.8804	.8285	.7548	.6503	.5024	.2938
17.20	.9735	.9615	.9441	.9191	.8833	.8320	.7587	.6545	.5064	.2966
17.40	.9746	.9629	.9459	.9214	.8861	.8353	.7626	.6587	.5104	.2994
17.60	.9756	.9642	.9477	.9236	.8888	.8387	.7664	.6628	.5143	.3022
17.80	.9766	.9655	.9494	.9258	.8915	.8419	.7702	.6668	.5182	.3050
18.00	.9776	.9668	.9510	.9279	.8942	.8451	.7739	.6708	.5221	.3078
18.20	.9785	.9680	.9526	.9299	.8967	.8482	.7775	.6748	.5259	.3106
18.40	.9794	.9692	.9541	.9319	.8992	.8513	.7811	.6787	.5297	.3133
18.60	.9802	.9703	.9556	.9338	.9017	.8543	.7846	.6826	.5335	.3161
18.80	.9810	.9714	.9570	.9357	.9040	.8572	.7881	.6864	.5372	.3188
19.00	.9818	.9724	.9584	.9375	.9064	.8601	.7915	.6902	.5409	.3216
19.20	.9825	.9734	.9598	.9393	.9086	.8629	.7949	.6939	.5446	.3243
19.40	.9832	.9744	.9611	.9410	.9108	.8657	.7982	.6976	.5483	.3270
19.60	.9839	.9753	.9623	.9427	.9130	.8684	.8014	.7013	.5519	.3297
19.80	.9846	.9762	.9636	.9443	.9151	.8710	.8046	.7049	.5555	.3324

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	UTILIZATION									
	.90	.91	.92	.93	.94	.95	.96	.97	.98	.99
20.00	.9852	.9771	.9647	.9459	.9172	.8736	.8077	.7084	.5591	.3350
20.20	.9858	.9779	.9659	.9474	.9192	.8762	.8108	.7119	.5626	.3377
20.40	.9864	.9787	.9670	.9489	.9211	.8787	.8139	.7154	.5661	.3404
20.60	.9869	.9795	.9681	.9503	.9230	.8811	.8169	.7188	.5696	.3430
20.80	.9874	.9803	.9691	.9517	.9249	.8835	.8198	.7222	.5730	.3456
21.00	.9880	.9810	.9701	.9531	.9267	.8858	.8227	.7256	.5765	.3483
21.20	.9884	.9817	.9711	.9544	.9285	.8881	.8256	.7289	.5799	.3509
21.40	.9889	.9823	.9720	.9557	.9302	.8904	.8284	.7321	.5832	.3535
21.60	.9894	.9830	.9729	.9570	.9319	.8926	.8311	.7354	.5866	.3561
21.80	.9898	.9836	.9738	.9582	.9336	.8948	.8339	.7386	.5899	.3586
22.00	.9902	.9842	.9746	.9594	.9352	.8969	.8365	.7417	.5932	.3612
22.20	.9906	.9848	.9754	.9605	.9367	.8990	.8392	.7448	.5964	.3638
22.40	.9910	.9853	.9762	.9616	.9383	.9010	.8418	.7479	.5997	.3663
22.60	.9914	.9859	.9770	.9627	.9398	.9030	.8443	.7509	.6029	.3688
22.80	.9917	.9864	.9778	.9638	.9412	.9049	.8468	.7539	.6061	.3714
23.00	.9920	.9869	.9785	.9648	.9426	.9069	.8493	.7569	.6092	.3739
23.20	.9924	.9874	.9792	.9658	.9440	.9087	.8517	.7598	.6124	.3764
23.40	.9927	.9878	.9798	.9668	.9454	.9106	.8541	.7627	.6155	.3789
23.60	.9930	.9883	.9805	.9677	.9467	.9124	.8564	.7656	.6186	.3814
23.80	.9933	.9887	.9811	.9686	.9480	.9141	.8587	.7684	.6216	.3839
24.00	.9935	.9891	.9817	.9695	.9492	.9159	.8610	.7712	.6247	.3863
24.20	.9938	.9895	.9823	.9704	.9505	.9176	.8632	.7740	.6277	.3888
24.40	.9940	.9899	.9829	.9712	.9517	.9192	.8654	.7767	.6307	.3912
24.60	.9943	.9903	.9835	.9720	.9528	.9208	.8676	.7794	.6336	.3937
24.80	.9945	.9906	.9840	.9728	.9540	.9224	.8697	.7820	.6366	.3961
25.00	.9947	.9910	.9845	.9736	.9551	.9240	.8718	.7847	.6395	.3985
25.20	.9950	.9913	.9850	.9743	.9562	.9255	.8739	.7872	.6424	.4009
25.40	.9952	.9916	.9855	.9750	.9572	.9270	.8759	.7898	.6452	.4033
25.60	.9954	.9919	.9860	.9758	.9583	.9285	.8779	.7923	.6481	.4057
25.80	.9955	.9922	.9864	.9764	.9593	.9299	.8799	.7948	.6509	.4081
26.00	.9957	.9925	.9869	.9771	.9603	.9314	.8818	.7973	.6537	.4105
26.20	.9959	.9928	.9873	.9778	.9612	.9327	.8837	.7998	.6565	.4128
26.40	.9961	.9930	.9877	.9784	.9622	.9341	.8856	.8022	.6592	.4152
26.60	.9962	.9933	.9881	.9790	.9631	.9354	.8874	.8046	.6620	.4175
26.80	.9964	.9935	.9885	.9796	.9640	.9367	.8892	.8069	.6647	.4199
27.00	.9965	.9938	.9889	.9802	.9649	.9380	.8910	.8092	.6674	.4222
27.20	.9967	.9940	.9892	.9807	.9657	.9392	.8928	.8115	.6700	.4245
27.40	.9968	.9942	.9896	.9813	.9665	.9405	.8945	.8138	.6727	.4268
27.60	.9969	.9944	.9899	.9818	.9673	.9417	.8962	.8161	.6753	.4291
27.80	.9971	.9946	.9902	.9823	.9681	.9428	.8979	.8183	.6779	.4314
28.00	.9972	.9948	.9905	.9828	.9689	.9440	.8995	.8205	.6805	.4337
28.20	.9973	.9950	.9908	.9833	.9697	.9451	.9011	.8226	.6831	.4359
28.40	.9974	.9952	.9911	.9838	.9704	.9462	.9027	.8248	.6856	.4382
28.60	.9975	.9954	.9914	.9842	.9711	.9473	.9043	.8269	.6881	.4404
28.80	.9976	.9955	.9917	.9847	.9718	.9484	.9058	.8290	.6906	.4427
29.00	.9977	.9957	.9920	.9851	.9725	.9494	.9073	.8310	.6931	.4449
29.20	.9978	.9959	.9922	.9855	.9732	.9504	.9088	.8331	.6956	.4471
29.40	.9979	.9960	.9925	.9859	.9738	.9514	.9103	.8351	.6980	.4494
29.60	.9980	.9962	.9927	.9863	.9744	.9524	.9117	.8371	.7004	.4516
29.80	.9981	.9963	.9930	.9867	.9751	.9534	.9132	.8390	.7028	.4538

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	UTILIZATION									
	.90	.91	.92	.93	.94	.95	.96	.97	.98	.99
30.00	.9981	.9964	.9932	.9871	.9757	.9543	.9146	.8410	.7052	.4559
30.20	.9982	.9966	.9934	.9875	.9763	.9552	.9159	.8429	.7076	.4581
30.40	.9983	.9967	.9936	.9878	.9768	.9561	.9173	.8448	.7099	.4603
30.60	.9984	.9968	.9938	.9882	.9774	.9570	.9186	.8466	.7123	.4625
30.80	.9984	.9969	.9940	.9885	.9779	.9579	.9199	.8485	.7146	.4646
31.00	.9985	.9970	.9942	.9888	.9785	.9587	.9212	.8503	.7169	.4668
31.20	.9985	.9971	.9944	.9891	.9790	.9596	.9225	.8521	.7191	.4689
31.40	.9986	.9972	.9946	.9894	.9795	.9604	.9237	.8539	.7214	.4710
31.60	.9987	.9973	.9948	.9897	.9800	.9612	.9250	.8557	.7236	.4731
31.80	.9987	.9974	.9949	.9900	.9805	.9619	.9262	.8574	.7258	.4752
32.00	.9988	.9975	.9951	.9903	.9810	.9627	.9273	.8591	.7280	.4773
32.20	.9988	.9976	.9953	.9906	.9814	.9635	.9285	.8608	.7302	.4794
32.40	.9989	.9977	.9954	.9909	.9819	.9642	.9297	.8625	.7324	.4815
32.60	.9989	.9978	.9956	.9911	.9823	.9649	.9308	.8641	.7345	.4836
32.80	.9990	.9979	.9957	.9914	.9827	.9656	.9319	.8658	.7367	.4857
33.00	.9990	.9980	.9958	.9916	.9831	.9663	.9330	.8674	.7388	.4877
33.20	.9990	.9980	.9960	.9918	.9836	.9670	.9341	.8690	.7409	.4898
33.40	.9991	.9981	.9961	.9921	.9840	.9677	.9351	.8706	.7429	.4918
33.60	.9991	.9982	.9962	.9923	.9843	.9683	.9362	.8721	.7450	.4939
33.80	.9992	.9982	.9964	.9925	.9847	.9690	.9372	.8737	.7470	.4959
34.00	.9992	.9983	.9965	.9927	.9851	.9696	.9382	.8752	.7491	.4979
34.20	.9992	.9984	.9966	.9929	.9855	.9702	.9392	.8767	.7511	.4999
34.40	.9992	.9984	.9967	.9931	.9858	.9708	.9402	.8782	.7531	.5019
34.60	.9993	.9985	.9968	.9933	.9861	.9714	.9412	.8797	.7551	.5039
34.80	.9993	.9985	.9969	.9935	.9865	.9720	.9421	.8811	.7570	.5059
35.00	.9993	.9986	.9970	.9937	.9868	.9725	.9430	.8825	.7590	.5079
35.20	.9994	.9986	.9971	.9939	.9871	.9731	.9440	.8840	.7609	.5099
35.40	.9994	.9987	.9972	.9941	.9874	.9736	.9449	.8854	.7628	.5118
35.60	.9994	.9987	.9973	.9942	.9877	.9741	.9457	.8867	.7647	.5138
35.80	.9994	.9988	.9974	.9944	.9880	.9747	.9466	.8881	.7666	.5157
36.00	.9995	.9988	.9975	.9945	.9883	.9752	.9475	.8894	.7685	.5177
36.20	.9995	.9989	.9975	.9947	.9886	.9757	.9483	.8908	.7704	.5196
36.40	.9995	.9989	.9976	.9948	.9889	.9762	.9492	.8921	.7722	.5215
36.60	.9995	.9990	.9977	.9950	.9892	.9766	.9500	.8934	.7740	.5234
36.80	.9995	.9990	.9978	.9951	.9894	.9771	.9508	.8947	.7758	.5253
37.00	.9996	.9990	.9978	.9953	.9897	.9776	.9516	.8959	.7776	.5272
37.20	.9996	.9991	.9979	.9954	.9899	.9780	.9523	.8972	.7794	.5291
37.40	.9996	.9991	.9980	.9955	.9902	.9785	.9531	.8984	.7812	.5310
37.60	.9996	.9991	.9981	.9957	.9904	.9789	.9539	.8997	.7829	.5329
37.80	.9996	.9992	.9981	.9958	.9906	.9793	.9546	.9009	.7847	.5348
38.00	.9996	.9992	.9982	.9959	.9909	.9797	.9553	.9021	.7864	.5366
38.20	.9997	.9992	.9982	.9960	.9911	.9802	.9561	.9032	.7881	.5385
38.40	.9997	.9992	.9983	.9961	.9913	.9806	.9568	.9044	.7898	.5403
38.60	.9997	.9993	.9983	.9962	.9915	.9809	.9575	.9056	.7915	.5422
38.80	.9997	.9993	.9984	.9963	.9917	.9813	.9581	.9067	.7932	.5440
39.00	.9997	.9993	.9985	.9965	.9919	.9817	.9588	.9078	.7948	.5458
39.20	.9997	.9994	.9985	.9966	.9921	.9821	.9595	.9089	.7965	.5477
39.40	.9997	.9994	.9986	.9966	.9923	.9824	.9601	.9100	.7981	.5495
39.60	.9997	.9994	.9986	.9967	.9925	.9828	.9608	.9111	.7997	.5513
39.80	.9998	.9994	.9986	.9968	.9927	.9831	.9614	.9122	.8013	.5531

T	PROBABILITY OF WAIT LESS THAN OR EQUAL TO T									
	UTILIZATION									
	.90	.91	.92	.93	.94	.95	.96	.97	.98	.99
40.00	.9998	.9994	.9987	.9969	.9929	.9835	.9620	.9132	.8029	.5549
40.20	.9998	.9995	.9987	.9970	.9930	.9838	.9626	.9143	.8045	.5566
40.40	.9998	.9995	.9988	.9971	.9932	.9841	.9632	.9153	.8061	.5584
40.60	.9998	.9995	.9988	.9972	.9934	.9845	.9638	.9163	.8076	.5602
40.80	.9998	.9995	.9988	.9973	.9935	.9848	.9644	.9174	.8092	.5620
41.00	.9998	.9995	.9989	.9973	.9937	.9851	.9650	.9183	.8107	.5637
41.20	.9998	.9996	.9989	.9974	.9938	.9854	.9655	.9193	.8122	.5655
41.40	.9998	.9996	.9990	.9975	.9940	.9857	.9661	.9203	.8137	.5672
41.60	.9998	.9996	.9990	.9976	.9941	.9860	.9666	.9213	.8152	.5689
41.80	.9998	.9996	.9990	.9976	.9943	.9862	.9672	.9222	.8167	.5707
42.00	.9998	.9996	.9991	.9977	.9944	.9865	.9677	.9232	.8182	.5724
42.20	.9999	.9996	.9991	.9978	.9945	.9868	.9682	.9241	.8196	.5741
42.40	.9999	.9996	.9991	.9978	.9947	.9871	.9687	.9250	.8211	.5758
42.60	.9999	.9997	.9991	.9979	.9948	.9873	.9692	.9259	.8225	.5775
42.80	.9999	.9997	.9992	.9979	.9949	.9876	.9697	.9268	.8240	.5792
43.00	.9999	.9997	.9992	.9980	.9950	.9878	.9702	.9277	.8254	.5809
43.20	.9999	.9997	.9992	.9981	.9952	.9881	.9707	.9285	.8268	.5825
43.40	.9999	.9997	.9992	.9981	.9953	.9883	.9712	.9294	.8282	.5842
43.60	.9999	.9997	.9993	.9982	.9954	.9885	.9716	.9303	.8295	.5859
43.80	.9999	.9997	.9993	.9982	.9955	.9888	.9721	.9311	.8309	.5875
44.00		.9997	.9993	.9983	.9956	.9890	.9725	.9319	.8323	.5892
44.20		.9997	.9993	.9983	.9957	.9892	.9730	.9327	.8336	.5908
44.40		.9998	.9994	.9984	.9958	.9894	.9734	.9336	.8349	.5925
44.60		.9998	.9994	.9984	.9959	.9897	.9738	.9344	.8363	.5941
44.80		.9998	.9994	.9985	.9960	.9899	.9743	.9351	.8376	.5957
45.00		.9998	.9994	.9985	.9961	.9901	.9747	.9359	.8389	.5974
45.20		.9998	.9994	.9985	.9962	.9903	.9751	.9367	.8402	.5990
45.40		.9998	.9995	.9986	.9963	.9905	.9755	.9375	.8415	.6006
45.60		.9998	.9995	.9986	.9964	.9907	.9759	.9382	.8427	.6022
45.80		.9998	.9995	.9987	.9965	.9908	.9763	.9390	.8440	.6038
46.00		.9998	.9995	.9987	.9966	.9910	.9767	.9397	.8452	.6054
46.20		.9998	.9995	.9987	.9967	.9912	.9770	.9404	.8465	.6069
46.40		.9998	.9995	.9988	.9967	.9914	.9774	.9411	.8477	.6085
46.60		.9998	.9996	.9988	.9968	.9916	.9778	.9419	.8489	.6101
46.80		.9998	.9996	.9988	.9969	.9917	.9781	.9426	.8501	.6116
47.00		.9998	.9996	.9989	.9970	.9919	.9785	.9432	.8513	.6132
47.20		.9999	.9996	.9989	.9970	.9921	.9788	.9439	.8525	.6147
47.40		.9999	.9996	.9989	.9971	.9922	.9792	.9446	.8537	.6163
47.60		.9999	.9996	.9990	.9972	.9924	.9795	.9453	.8549	.6178
47.80		.9999	.9996	.9990	.9973	.9925	.9798	.9459	.8561	.6194
48.00		.9999	.9996	.9990	.9973	.9927	.9802	.9466	.8572	.6209
48.20		.9999	.9997	.9991	.9974	.9928	.9805	.9472	.8584	.6224
48.40		.9999	.9997	.9991	.9974	.9930	.9808	.9479	.8595	.6239
48.60		.9999	.9997	.9991	.9975	.9931	.9811	.9485	.8606	.6254
48.80		.9999	.9997	.9991	.9976	.9932	.9814	.9491	.8617	.6269
49.00			.9997	.9992	.9976	.9934	.9817	.9497	.8628	.6284
49.20			.9997	.9992	.9977	.9935	.9820	.9503	.8639	.6299
49.40			.9997	.9992	.9977	.9936	.9823	.9509	.8650	.6314
49.60			.9997	.9992	.9978	.9938	.9826	.9515	.8661	.6329
49.80			.9997	.9992	.9978	.9939	.9828	.9521	.8672	.6343
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