



UNIVERSITY
OF
JOHANNESBURG

PROGRAM

: NATIONAL DIPLOMA
ENGINEERING METALLURGY

SUBJECT

: **QUALITY CONTROL II**

CODE

: **TKU21-1**

DATE

: MID-YEAR EXAMINATION
31 MAY 2014

DURATION

: (SESSION 2) 12:30 - 15:30

WEIGHT

: 40 : 60

FULL MARKS

: 92

TOTAL MARKS

: 90

EXAMINER

: Dr S C DU PLESSIS

MODERATOR

: Dr S BHERO

NUMBER OF PAGES

: 4 pages plus 8 Annexures

INSTRUCTIONS
PERMITTED (ONLY

: CALCULATORS ARE

ONE PER STUDENT

REQUIREMENTS

: GRAPH PAPER

INSTRUCTIONS TO STUDENTS

ANSWER ALL QUESTIONS

QUALITY CONTROL 2 (TKU21-2)

QUESTION 1

[10]_____

The data given below is the weight in kilograms of members of a certain club.

76	78	62	90	88	53	65	78	77	78	77	89	77	70
71	65	75	86	53	76	63	74	65	57	78	90	65	77
69	99	77	44	94	75	69	78	59	72	82	96	69	79
52	56	62	90	81	76	52	48	70	49	72	88	76	49

1.1 Construct a tally sheet (4)

1.2 Construct a grouped frequency distribution table (6)

QUESTION 2

[9]

2.1 What is the difference between Quality control and Quality assurance? (3)

2.2 What is the difference between control limits and specifications limits? (3)

2.3 What is the difference between a control chart for variables and control chart for Attributes? (3)

QUESTION 3

[11]

A sample of 10 students was fed a special diet and the following weight gains (in grams) were observed at the end of one month period:

6,7	2,7	3,6	3,4	8,3	5,9	2,5	4,8	3,6	2,7
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

3.1 Calculate the mean weight (2)

3.2 Find the median weight (3)

3.3 Find the modal weight (2)

3.4 Calculate the standard deviation (4)

QUESTION 4

[15]

The following frequency distribution summarises the weekly wages in thousand for a group of 48 enginners.

Weekly wages(In Rand)	Frequency
1 - < 3	4
3 - < 5	15
5 - < 7	7
7 - < 9	3
9 - < 11	10
11 -< 13	9

4.1 Calculate the mean (2)
QUALITY CONTROL 2 (TKU21-2)

4.2 Calculate the mode (2)

4.3 Estimate the median using an appropriate graph (4)

4.4 Calculate the variance (4)

4.5 Comment on the shape of the distribution (3)

QUESTION 5

[21]

The following table summarise the number inspected and the count of nonconformities units for 4 weeks at 4 days per week. The tableau below describes.

Date	Number inspected	Count of Nonconformities
Feb 1	45	50
2	31	37
3	34	32
4	46	71
5	44	65
6	18	31

7	49	62
8	38	57
9	41	36
10	47	62
11	34	54
12	26	32
13	37	40
14	51	67
15	24	30
16	42	50

5.1 Calculate the trial control limits for each subgroup (8)

5.2 Determine the control limits for the next 4 week period (8)

5.3 Plot the graph (5)

QUESTION 6

[8]

A steady stream of light bulbs has a fraction nonconforming of 0,09. If 30 are sampled, what is the probability:

6.1 of having 3 nonconforming units? Use the poisson distribution. (4)

6.2 of having more than 2 nonconforming units? Use the poisson distribution. (4)

QUALITY CONTROL 2 (TKU21-2)

QUESTION 7

[9]

Each sample of coal either contains a rare molecule or not. It has a 45 % chance of containing the area molecule. Assume that the samples are independent. If there are 12 samples in total, find the probability that in the next twelve samples:

7.1 At most 3 does contain the rare molecule. (4)

7.2 At least 2 does contain the rare molecule. (5)

QUESTION 8

[9]

A sampling plan is desired with producer's risk of 0,05 of not accepting 0,8 % nonconforming units and a consumer's risk of 0,9 % of not accepting 6,8 % nonconforming units. Select the sample with the highest sample size and the lowest sample size.

TOTAL MARKS: 90

APPENDIX

Table A	Areas Under the Normal Curve
Table B	Factors for Computing Central Lines and 3σ Control Limits for $\bar{X}$, s , and R charts
Table C	The Poisson Distribution
Table D	Random Numbers
Table E	Commonly Used Conversion Factors

Table F	Critical Values of t Distribution
Table G-1	Critical Values of F Distribution ($\alpha = 0.1$)
Table G-2	Critical Values of F Distribution ($\alpha = 0.05$)
Table G-3	Critical Values of F Distribution ($\alpha = 0.01$)
Table H	Orthogonal Arrays

TABLE A Areas Under the Normal Curve^a

$\frac{X - \mu}{\sigma}$	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00
-3.5	0.00017	0.00017	0.00018	0.00019	0.00019	0.00020	0.00021	0.00022	0.00022	0.00023
-3.4	0.00024	0.00025	0.00026	0.00027	0.00028	0.00029	0.00030	0.00031	0.00033	0.00034
-3.3	0.00035	0.00036	0.00038	0.00039	0.00040	0.00042	0.00043	0.00045	0.00047	0.00048
-3.2	0.00050	0.00052	0.00054	0.00056	0.00058	0.00060	0.00062	0.00064	0.00066	0.00069
-3.1	0.00071	0.00074	0.00076	0.00079	0.00082	0.00085	0.00087	0.00090	0.00094	0.00097
-3.0	0.00100	0.00104	0.00107	0.00111	0.00114	0.00118	0.00122	0.00126	0.00131	0.00135
-2.9	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0017	0.0018	0.0019
-2.8	0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026
-2.7	0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035
-2.6	0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047
-2.5	0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062
-2.4	0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082
-2.3	0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107
-2.2	0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139
-2.1	0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179
-2.0	0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228
-1.9	0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287
-1.8	0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359
-1.7	0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446
-1.6	0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548
-1.5	0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668
-1.4	0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808
-1.3	0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968
-1.2	0.0895	0.1003	0.1020	0.1038	0.1057	0.1075	0.1093	0.1112	0.1131	0.1151
-1.1	0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357
-1.0	0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587
-0.9	0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841
-0.8	0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119
-0.7	0.2148	0.2177	0.2207	0.2236	0.2266	0.2297	0.2327	0.2358	0.2389	0.2420
-0.6	0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743
-0.5	0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085

TABLE A (Continued)

$\frac{X_i - \mu}{\sigma}$	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00
-0.4	0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446
-0.3	0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821
-0.2	0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207
-0.1	0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602
-0.0	0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000
$\frac{X_i - \mu}{\sigma}$	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
+0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
+0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
+0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
+0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
+0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
+0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7089	0.7123	0.7157	0.7190	0.7224
+0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
+0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
+0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8079	0.8106	0.8133
+0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
+1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
+1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
+1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
+1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
+1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
+1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
+1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
+1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
+1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
+1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
+2.0	0.9773	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
+2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
+2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
+2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
+2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
+2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
+2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
+2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
+2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
+2.9	0.9981	0.9982	0.9983	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
+3.0	0.99865	0.99869	0.99874	0.99878	0.99882	0.99886	0.99889	0.99893	0.99896	0.99900
+3.1	0.99903	0.99906	0.99910	0.99913	0.99915	0.99918	0.99921	0.99924	0.99926	0.99929
+3.2	0.99931	0.99934	0.99936	0.99938	0.99940	0.99942	0.99944	0.99946	0.99948	0.99950
+3.3	0.99952	0.99953	0.99955	0.99957	0.99958	0.99960	0.99961	0.99962	0.99964	0.99965
+3.4	0.99966	0.99967	0.99969	0.99970	0.99971	0.99972	0.99973	0.99974	0.99975	0.99976
+3.5	0.99977	0.99978	0.99978	0.99979	0.99980	0.99981	0.99981	0.99982	0.99983	0.99983

*Proportion of total area under the curve that is under the proportion of the curve from $-\infty$ to $(X_i - \mu)/\sigma$ (X_i represents any desired value of the variable X)

TABLE B Factors for Computing Central Lines and 3σ Control Limits for $\bar{X}$, s , and R Charts

Observations in Sample, n	CHART FOR AVERAGES					CHART FOR STANDARD DEVIATIONS					CHART FOR RANGES				
	Factors for Control Limits					Factor for Central Line					Factors for Control Limits				
	A	A_2	A_3	c_4	B_3	B_4	B_5	B_6	d_2	d_3	D_1	D_2	D_3	D_4	
2	2.121	1.880	2.659	0.7979	0	3.267	0	2.606	1.128	0.853	0	3.686	0	3.267	
3	1.732	1.023	1.954	0.8862	0	2.568	0	2.276	1.693	0.888	0	4.358	0	2.574	
4	1.500	0.729	1.628	0.9213	0	2.266	0	2.088	2.059	0.880	0	4.698	0	2.282	
5	1.342	0.577	1.427	0.9400	0	2.089	0	1.964	2.326	0.864	0	4.918	0	2.114	
6	1.226	0.483	1.287	0.9515	0.030	1.970	0.029	1.874	2.534	0.848	0	5.078	0	2.004	
7	1.134	0.419	1.182	0.9594	0.118	1.882	0.113	1.806	2.704	0.833	0.204	5.204	0.076	1.924	
8	1.061	0.373	1.099	0.9650	0.185	1.815	0.179	1.751	2.847	0.820	0.388	5.306	0.136	1.864	
9	1.000	0.337	1.032	0.9693	0.239	1.761	0.232	1.707	2.970	0.808	0.547	5.393	0.184	1.816	
10	0.949	0.308	0.975	0.9727	0.284	1.716	0.276	1.669	3.078	0.797	0.687	5.469	0.223	1.777	
11	0.905	0.285	0.927	0.9754	0.321	1.679	0.313	1.637	3.173	0.787	0.811	5.535	0.256	1.744	
12	0.866	0.266	0.886	0.9776	0.354	1.646	0.346	1.610	3.258	0.778	0.922	5.594	0.283	1.717	
13	0.832	0.249	0.850	0.9794	0.382	1.618	0.374	1.585	3.336	0.770	1.025	5.647	0.307	1.693	
14	0.802	0.235	0.817	0.9810	0.406	1.594	0.399	1.563	3.407	0.763	1.118	5.696	0.328	1.672	
15	0.775	0.223	0.789	0.9823	0.428	1.572	0.421	1.544	3.472	0.756	1.203	5.741	0.347	1.653	
16	0.750	0.212	0.763	0.9835	0.448	1.562	0.440	1.526	3.532	0.750	1.282	5.782	0.363	1.637	
17	0.728	0.203	0.739	0.9845	0.466	1.534	0.458	1.511	3.588	0.744	1.356	5.820	0.378	1.622	
18	0.707	0.194	0.718	0.9854	0.482	1.518	0.475	1.496	3.640	0.739	1.424	5.856	0.391	1.608	
19	0.688	0.187	0.698	0.9862	0.497	1.503	0.490	1.483	3.689	0.734	1.487	5.891	0.403	1.597	
20	0.671	0.180	0.680	0.9869	0.510	1.490	0.504	1.470	3.735	0.729	1.549	5.921	0.415	1.585	

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1.2%, the OC
obtained. Each

TABLE 9-4 np Values for Corresponding c Values and Typical Producer's and Consumer's Risks

c	$P_a = 0.99$ ($\alpha = 0.01$)	$P_a = 0.95$ ($\alpha = 0.05$)	$P_a = 0.90$ ($\alpha = 0.10$)	$P_a = 0.10$ ($\beta = 0.10$)	$P_a = 0.05$ ($\beta = 0.05$)	$P_a = 0.01$ ($\beta = 0.01$)	RATIO OF $P_{0.10}/P_{0.95}$
0	0.010	0.051	0.105	2.303	2.996	4.605	44.890
1	0.149	0.355	0.532	3.890	4.744	6.638	10.946
2	0.436	0.818	1.102	5.322	6.296	8.406	6.509
3	0.823	1.366	1.745	6.681	7.754	10.045	4.890
4	1.279	1.970	2.433	7.994	9.154	11.605	4.057
5	1.785	2.613	3.152	9.275	10.513	13.108	3.549
6	2.330	3.286	3.895	10.532	11.842	14.571	3.206
7	2.906	3.981	4.656	11.771	13.148	16.000	2.957
8	3.507	4.695	5.432	12.995	14.434	17.403	2.768
9	4.130	5.426	6.221	14.206	15.705	18.783	2.618
10	4.771	6.169	7.021	15.407	16.962	20.145	2.497
11	5.428	6.924	7.829	16.598	18.208	21.490	2.397
12	6.099	7.690	8.646	17.782	19.442	22.821	2.312
13	6.782	8.464	9.470	18.958	20.668	24.139	2.240
14	7.477	9.246	10.300	20.128	21.886	25.446	2.177
15	8.181	10.035	11.135	21.292	23.098	26.743	2.122

Source: Extracted by permission from J. M. Cameron, "Tables for Constructing and for Computing the Operating Characteristics of Single-Sampling Plans," *Industry Quality Control*, Vol. 9, No. 1 (July 1952): 39.

TABLE C The Poisson Distribution $P(c) = \frac{(np_0)^c}{c!} e^{-np_0}$ (Cumulative Values Are in Parentheses)

c np_0	0.1	0.2	0.3	0.4	0.5
0	0.905 (0.905)	0.819 (0.819)	0.741 (0.741)	0.670 (0.670)	0.607 (0.607)
1	0.091 (0.996)	0.164 (0.983)	0.222 (0.963)	0.268 (0.938)	0.303 (0.910)
2	0.004 (1.000)	0.016 (0.999)	0.033 (0.996)	0.054 (0.992)	0.076 (0.986)
3		0.010 (1.000)	0.004 (1.000)	0.007 (0.999)	0.013 (0.999)
4		0.001 (1.000)	0.001 (1.000)		
c np_0	0.6	0.7	0.8	0.9	1.0
0	0.549 (0.549)	0.497 (0.497)	0.449 (0.449)	0.406 (0.406)	0.368 (0.368)
1	0.329 (0.878)	0.349 (0.845)	0.359 (0.808)	0.366 (0.772)	0.368 (0.736)
2	0.099 (0.977)	0.122 (0.967)	0.144 (0.952)	0.166 (0.938)	0.184 (0.920)
3	0.020 (0.997)	0.028 (0.995)	0.039 (0.991)	0.049 (0.987)	0.061 (0.981)
4	0.003 (1.000)	0.005 (1.000)	0.008 (0.999)	0.011 (0.998)	0.016 (0.997)
5			0.001 (1.000)	0.002 (1.000)	0.003 (1.000)
c np_0	1.1	1.2	1.3	1.4	1.5
0	0.333 (0.333)	0.301 (0.301)	0.273 (0.273)	0.247 (0.247)	0.223 (0.223)
1	0.366 (0.699)	0.361 (0.662)	0.354 (0.627)	0.345 (0.592)	0.335 (0.558)
2	0.201 (0.900)	0.217 (0.879)	0.230 (0.857)	0.242 (0.834)	0.251 (0.809)
3	0.074 (0.974)	0.087 (0.966)	0.100 (0.957)	0.113 (0.947)	0.126 (0.935)
4	0.021 (0.995)	0.026 (0.992)	0.032 (0.989)	0.039 (0.986)	0.047 (0.982)
5	0.004 (0.999)	0.007 (0.999)	0.009 (0.998)	0.011 (0.997)	0.014 (0.996)
6	0.001 (1.000)	0.001 (1.000)	0.002 (1.000)	0.003 (1.000)	0.004 (1.000)
c np_0	1.6	1.7	1.8	1.9	2.0
0	0.202 (0.202)	0.183 (0.183)	0.165 (0.165)	0.150 (0.150)	0.135 (0.135)
1	0.323 (0.525)	0.311 (0.494)	0.298 (0.463)	0.284 (0.434)	0.271 (0.406)
2	0.258 (0.783)	0.264 (0.758)	0.268 (0.731)	0.270 (0.704)	0.271 (0.677)
3	0.138 (0.921)	0.149 (0.907)	0.161 (0.892)	0.171 (0.875)	0.180 (0.857)
4	0.055 (0.976)	0.064 (0.971)	0.072 (0.964)	0.081 (0.956)	0.090 (0.947)
5	0.018 (0.994)	0.022 (0.993)	0.026 (0.990)	0.031 (0.987)	0.036 (0.983)
6	0.005 (0.999)	0.006 (0.999)	0.008 (0.998)	0.010 (0.997)	0.012 (0.995)
7	0.001 (1.000)	0.001 (1.000)	0.002 (1.000)	0.003 (1.000)	0.004 (0.999)
8					0.001 (1.000)
c np_0	2.1	2.2	2.3	2.4	2.5
0	0.123 (0.123)	0.111 (0.111)	0.100 (0.100)	0.091 (0.091)	0.082 (0.082)
1	0.257 (0.380)	0.244 (0.355)	0.231 (0.331)	0.218 (0.309)	0.205 (0.287)
2	0.270 (0.650)	0.268 (0.623)	0.265 (0.596)	0.261 (0.570)	0.256 (0.543)
3	0.189 (0.839)	0.197 (0.820)	0.203 (0.799)	0.209 (0.779)	0.214 (0.757)
4	0.099 (0.938)	0.108 (0.928)	0.117 (0.916)	0.125 (0.904)	0.134 (0.891)
5	0.042 (0.980)	0.048 (0.976)	0.054 (0.970)	0.060 (0.964)	0.067 (0.958)
6	0.015 (0.995)	0.017 (0.993)	0.021 (0.991)	0.024 (0.988)	0.028 (0.986)
7	0.004 (0.999)	0.005 (0.998)	0.007 (0.998)	0.008 (0.996)	0.010 (0.996)
8	0.001 (1.000)	0.002 (1.000)	0.002 (1.000)	0.003 (0.999)	0.003 (0.999)
9				0.001 (1.000)	0.001 (1.000)

TABLE C (Continued)

c/p_0	2.6	2.7	2.8	2.9	3.0
0	0.074 (0.074)	0.067 (0.067)	0.061 (0.061)	0.055 (0.055)	0.050 (0.050)
1	0.193 (0.267)	0.182 (0.249)	0.170 (0.231)	0.160 (0.215)	0.149 (0.199)
2	0.251 (0.518)	0.245 (0.494)	0.238 (0.469)	0.231 (0.446)	0.224 (0.423)
3	0.218 (0.736)	0.221 (0.715)	0.223 (0.692)	0.224 (0.670)	0.224 (0.647)
4	0.141 (0.877)	0.149 (0.864)	0.156 (0.848)	0.162 (0.832)	0.168 (0.815)
5	0.074 (0.951)	0.080 (0.944)	0.087 (0.935)	0.094 (0.926)	0.101 (0.916)
6	0.032 (0.983)	0.036 (0.980)	0.041 (0.976)	0.045 (0.971)	0.050 (0.966)
7	0.012 (0.995)	0.014 (0.994)	0.016 (0.992)	0.019 (0.990)	0.022 (0.988)
8	0.004 (0.999)	0.005 (0.999)	0.006 (0.998)	0.007 (0.997)	0.008 (0.996)
9	0.001 (1.000)	0.001 (1.000)	0.002 (1.000)	0.002 (0.999)	0.003 (0.999)
10				0.001 (1.000)	0.001 (1.000)
c/p_0	3.1	3.2	3.3	3.4	3.5
0	0.045 (0.045)	0.041 (0.041)	0.037 (0.037)	0.033 (0.033)	0.030 (0.030)
1	0.140 (0.185)	0.130 (0.171)	0.122 (0.159)	0.113 (0.146)	0.106 (0.136)
2	0.216 (0.401)	0.209 (0.380)	0.201 (0.360)	0.193 (0.339)	0.185 (0.321)
3	0.224 (0.625)	0.223 (0.603)	0.222 (0.582)	0.219 (0.558)	0.216 (0.537)
4	0.173 (0.798)	0.178 (0.781)	0.182 (0.764)	0.186 (0.744)	0.189 (0.726)
5	0.107 (0.906)	0.114 (0.895)	0.120 (0.884)	0.126 (0.870)	0.132 (0.858)
6	0.056 (0.961)	0.061 (0.956)	0.066 (0.950)	0.071 (0.941)	0.077 (0.936)
7	0.025 (0.986)	0.028 (0.984)	0.031 (0.981)	0.035 (0.976)	0.038 (0.973)
8	0.010 (0.996)	0.011 (0.995)	0.012 (0.993)	0.015 (0.991)	0.017 (0.990)
9	0.003 (0.999)	0.004 (0.999)	0.005 (0.998)	0.006 (0.997)	0.007 (0.997)
10	0.001 (1.000)	0.001 (1.000)	0.002 (1.000)	0.002 (0.999)	0.002 (0.999)
11				0.001 (1.000)	0.001 (1.000)
c/p_0	3.6	3.7	3.8	3.9	4.0
0	0.027 (0.027)	0.025 (0.025)	0.022 (0.022)	0.020 (0.020)	0.018 (0.018)
1	0.098 (0.125)	0.091 (0.116)	0.085 (0.107)	0.079 (0.099)	0.073 (0.091)
2	0.177 (0.302)	0.169 (0.285)	0.161 (0.268)	0.154 (0.253)	0.147 (0.238)
3	0.213 (0.515)	0.209 (0.494)	0.205 (0.473)	0.200 (0.453)	0.195 (0.433)
4	0.191 (0.706)	0.193 (0.687)	0.194 (0.667)	0.195 (0.648)	0.195 (0.628)
5	0.138 (0.844)	0.143 (0.830)	0.148 (0.815)	0.152 (0.800)	0.157 (0.785)
6	0.083 (0.927)	0.088 (0.918)	0.094 (0.909)	0.099 (0.899)	0.104 (0.889)
7	0.042 (0.969)	0.047 (0.965)	0.051 (0.960)	0.055 (0.954)	0.060 (0.949)
8	0.019 (0.988)	0.022 (0.987)	0.024 (0.984)	0.027 (0.981)	0.030 (0.979)
9	0.008 (0.996)	0.009 (0.996)	0.010 (0.994)	0.012 (0.993)	0.013 (0.992)
10	0.003 (0.999)	0.003 (0.999)	0.004 (0.998)	0.004 (0.997)	0.005 (0.997)
11	0.001 (1.000)	0.001 (1.000)	0.001 (0.999)	0.002 (0.999)	0.002 (0.999)
12			0.001 (1.000)	0.001 (1.000)	0.001 (1.000)
c/p_0	4.1	4.2	4.3	4.4	4.5
0	0.017 (0.017)	0.015 (0.015)	0.014 (0.014)	0.012 (0.012)	0.011 (0.011)
1	0.068 (0.085)	0.063 (0.078)	0.058 (0.072)	0.054 (0.066)	0.050 (0.061)
2	0.139 (0.224)	0.132 (0.210)	0.126 (0.198)	0.119 (0.185)	0.113 (0.174)
3	0.190 (0.414)	0.185 (0.395)	0.180 (0.378)	0.174 (0.359)	0.169 (0.343)
4	0.195 (0.609)	0.195 (0.590)	0.193 (0.571)	0.192 (0.551)	0.190 (0.533)

(Continued)

TABLE C (Continued)

c/p_0	4.1	4.2	4.3	4.4	4.5
5	0.160 (0.769)	0.163 (0.763)	0.166 (0.737)	0.169 (0.720)	0.171 (0.704)
6	0.110 (0.879)	0.114 (0.867)	0.119 (0.856)	0.124 (0.844)	0.128 (0.832)
7	0.064 (0.943)	0.069 (0.936)	0.073 (0.929)	0.078 (0.922)	0.082 (0.914)
8	0.033 (0.976)	0.036 (0.972)	0.040 (0.969)	0.043 (0.965)	0.046 (0.960)
9	0.015 (0.991)	0.017 (0.989)	0.019 (0.988)	0.021 (0.986)	0.023 (0.983)
10	0.006 (0.997)	0.007 (0.996)	0.008 (0.996)	0.009 (0.995)	0.011 (0.994)
11	0.002 (0.999)	0.003 (0.999)	0.003 (0.999)	0.004 (0.999)	0.004 (0.998)
12	0.001 (1.000)	0.001 (1.000)	0.001 (1.000)	0.001 (1.000)	0.001 (0.999)
13					0.001 (1.000)
c/p_0	4.6	4.7	4.8	4.9	5.0
0	0.010 (0.010)	0.009 (0.009)	0.008 (0.008)	0.008 (0.008)	0.007 (0.007)
1	0.046 (0.056)	0.043 (0.052)	0.039 (0.047)	0.037 (0.045)	0.034 (0.041)
2	0.106 (0.162)	0.101 (0.153)	0.095 (0.142)	0.090 (0.135)	0.084 (0.125)
3	0.163 (0.325)	0.157 (0.310)	0.152 (0.294)	0.146 (0.281)	0.140 (0.265)
4	0.188 (0.513)	0.185 (0.495)	0.182 (0.476)	0.179 (0.460)	0.176 (0.441)
5	0.172 (0.685)	0.174 (0.669)	0.175 (0.651)	0.175 (0.635)	0.176 (0.617)
6	0.132 (0.817)	0.136 (0.805)	0.140 (0.791)	0.143 (0.778)	0.146 (0.763)
7	0.087 (0.904)	0.091 (0.896)	0.096 (0.887)	0.100 (0.878)	0.105 (0.868)
8	0.050 (0.954)	0.054 (0.950)	0.058 (0.945)	0.061 (0.939)	0.065 (0.933)
9	0.026 (0.980)	0.028 (0.978)	0.031 (0.976)	0.034 (0.973)	0.036 (0.969)
10	0.012 (0.992)	0.013 (0.991)	0.015 (0.991)	0.016 (0.989)	0.018 (0.987)
11	0.005 (0.997)	0.006 (0.997)	0.006 (0.997)	0.007 (0.996)	0.008 (0.995)
12	0.002 (0.999)	0.002 (0.999)	0.002 (0.999)	0.003 (0.999)	0.003 (0.998)
13	0.001 (1.000)	0.001 (1.000)	0.001 (1.000)	0.001 (1.000)	0.001 (0.999)
14					0.001 (1.000)
c/p_0	6.0	7.0	8.0	9.0	10.0
0	0.002 (0.002)	0.001 (0.001)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
1	0.015 (0.017)	0.006 (0.007)	0.003 (0.003)	0.001 (0.001)	0.000 (0.000)
2	0.045 (0.062)	0.022 (0.029)	0.011 (0.014)	0.005 (0.006)	0.002 (0.002)
3	0.089 (0.151)	0.052 (0.081)	0.029 (0.043)	0.015 (0.021)	0.007 (0.009)
4	0.134 (0.285)	0.091 (0.172)	0.057 (0.100)	0.034 (0.055)	0.019 (0.028)
5	0.161 (0.446)	0.128 (0.300)	0.092 (0.192)	0.061 (0.116)	0.038 (0.066)
6	0.161 (0.607)	0.149 (0.449)	0.122 (0.314)	0.091 (0.091)	0.063 (0.129)
7	0.138 (0.745)	0.149 (0.598)	0.140 (0.454)	0.117 (0.324)	0.090 (0.219)
8	0.103 (0.848)	0.131 (0.729)	0.140 (0.594)	0.132 (0.455)	0.113 (0.332)
9	0.069 (0.917)	0.102 (0.831)	0.124 (0.718)	0.132 (0.588)	0.124 (0.457)
10	0.041 (0.958)	0.071 (0.902)	0.099 (0.817)	0.119 (0.707)	0.125 (0.582)
11	0.023 (0.981)	0.045 (0.947)	0.072 (0.889)	0.097 (0.804)	0.114 (0.696)
12	0.011 (0.992)	0.026 (0.973)	0.048 (0.937)	0.073 (0.877)	0.095 (0.791)
13	0.005 (0.997)	0.014 (0.987)	0.030 (0.967)	0.050 (0.927)	0.073 (0.864)
14	0.002 (0.999)	0.007 (0.994)	0.017 (0.984)	0.032 (0.959)	0.052 (0.916)
15	0.001 (1.000)	0.003 (0.997)	0.009 (0.993)	0.019 (0.978)	0.035 (0.951)
16		0.002 (0.999)	0.004 (0.997)	0.011 (0.989)	0.022 (0.973)
17		0.001 (1.000)	0.002 (0.999)	0.006 (0.995)	0.013 (0.986)

TABLE C (Continued)

$c np_0$	5.0	7.0	8.0	9.0	10.0
18			0.001 (1.000)	0.003 (0.998)	0.007 (0.993)
19				0.001 (0.999)	0.004 (0.997)
20				0.001 (1.000)	0.002 (0.999)
21					0.001 (1.000)
$c np_0$	11.0	12.0	13.0	14.0	15.0
0	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
1	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
2	0.001 (0.001)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
3	0.004 (0.005)	0.002 (0.002)	0.001 (0.001)	0.000 (0.000)	0.000 (0.000)
4	0.010 (0.015)	0.005 (0.007)	0.003 (0.004)	0.001 (0.001)	0.001 (0.001)
5	0.022 (0.037)	0.013 (0.020)	0.007 (0.011)	0.004 (0.005)	0.002 (0.003)
6	0.041 (0.078)	0.025 (0.045)	0.015 (0.026)	0.009 (0.014)	0.005 (0.008)
7	0.065 (0.143)	0.044 (0.089)	0.028 (0.054)	0.017 (0.031)	0.010 (0.018)
8	0.089 (0.232)	0.066 (0.155)	0.046 (0.100)	0.031 (0.062)	0.019 (0.037)
9	0.109 (0.341)	0.087 (0.242)	0.066 (0.166)	0.047 (0.109)	0.032 (0.069)
10	0.119 (0.460)	0.105 (0.347)	0.086 (0.252)	0.066 (0.175)	0.049 (0.118)
11	0.119 (0.579)	0.114 (0.461)	0.101 (0.353)	0.084 (0.259)	0.066 (0.184)
12	0.109 (0.688)	0.114 (0.575)	0.110 (0.463)	0.099 (0.358)	0.083 (0.267)
13	0.098 (0.781)	0.106 (0.681)	0.110 (0.573)	0.106 (0.464)	0.096 (0.363)
14	0.073 (0.854)	0.091 (0.772)	0.102 (0.675)	0.106 (0.570)	0.102 (0.465)
15	0.053 (0.907)	0.072 (0.844)	0.088 (0.763)	0.099 (0.669)	0.102 (0.567)
16	0.037 (0.944)	0.054 (0.898)	0.072 (0.835)	0.087 (0.756)	0.096 (0.663)
17	0.024 (0.968)	0.038 (0.936)	0.055 (0.890)	0.071 (0.827)	0.085 (0.748)
18	0.015 (0.983)	0.026 (0.962)	0.040 (0.930)	0.056 (0.883)	0.071 (0.819)
19	0.008 (0.991)	0.016 (0.978)	0.027 (0.957)	0.041 (0.924)	0.056 (0.875)
20	0.005 (0.996)	0.010 (0.988)	0.018 (0.975)	0.029 (0.953)	0.042 (0.917)
21	0.002 (0.998)	0.006 (0.994)	0.011 (0.986)	0.019 (0.972)	0.030 (0.947)
22	0.001 (0.999)	0.003 (0.997)	0.006 (0.992)	0.012 (0.984)	0.020 (0.967)
23	0.001 (1.000)	0.002 (0.999)	0.004 (0.996)	0.007 (0.991)	0.013 (0.980)
24		0.001 (1.000)	0.002 (0.998)	0.004 (0.995)	0.008 (0.988)
25			0.001 (0.999)	0.003 (0.998)	0.005 (0.993)
26			0.001 (1.000)	0.001 (0.999)	0.003 (0.996)
27				0.001 (1.000)	0.002 (0.998)
28					0.001 (0.999)
29					0.001 (1.000)