UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF INDUSTRIAL TECHNOLOGY

FINAL EXAMINATION

JANUARY 2016 SEMESTER

COURSE CODE	:	JQB 21503
COURSE TITLE	:	STATISTICAL QUALITY CONTROL
PROGRAMME LEVEL	:	BACHELOR
DATE	:	31 MAY 2016
TIME	:	2.30PM - 5.30PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consists of ONE (1) sections, Section A
4. Answer FOUR (4) questions from FIVE (5) questions.
5. Please write your answers on the answer booklet provided.
6. Table and formula are enclosed as reference.
7. Please answer all questions in English only.

THERE ARE 5 PAGES OF QUESTIONS EXCLUDING THIS PAGE.

SECTION A: (Total: 100 marks)

INSTRUCTION: Choose FOUR (4) questions only.

Please use the answer booklet provided.

Question 1

(a) A new machine has just been installed to cut and rough-shape large slugs. One of the critical measurements is the outside diameter. The quality control inspector randomly selected 2 slugs each hours, measured the outside diameter and recorded the results.

Sample 1: 87.1, 86.9, 87.5, 86.0, 87.1, 88.0, 87.3, 88.5, 88.4

Sample 2: 88.4, 88.0, 87.1, 86.2, 87.9, 87.6, 86.9, 87.1, 87.4

i) Calculate median for sample 1 and 2

(4 marks)

ii) Calculate quartile 1 and 3 for each sample

(6 marks)

iii) Based on answer in (i) and (ii), compare the both of sample by using suitable graphical presentation. (Use graph paper)

(12 marks)

(b) Quality Control is used to monitor both the precision and accuracy of the assay in order to provide reliable results. Sketch the situation precise and accurate and not accurate and not precise.

(3 marks)

Question 2

A quality control inspector at the Coco Soft drink company has taken 25 sample with four observation each of the volume of bottles filled. The computed means and range are shown table 1 below:

Table 1: The 25 sample of volume bottle filled

Sample	Average	Range
1	15.91	0.19
2	15.99	0.27
3	15.92	0.17
4	15.93	0.46
5	15.98	0.47
6	16.03	0.20
7	15.96	0.46
8	15.93	0.20
9	15.96	0.21
10	15.83	0.30
11	15.99	0.29
12	15.96	0.43
13	15.83	0.24
14	15.91	0.37
15	16.05	0.31
16	15.99	0.29
17	15.86	0.33
18	16.01	0.34
19	15.98	0.28
20	16.02	0.20
21	16.00	0.23
22	15.90	0.16
23	15.86	0.32
24	15.94	0.15
25	15.94	0.30

With reference to above data

(a) Calculate the value of $\bar{\bar{x}}$ and $\bar{R}$

(4 marks)

(b) Compute the control limits for X-bar and R chart

(10 marks)

(c) Based answer in (b), construct and comment the X-bar and R chart. (Use graph paper)

(11 marks)

Question 3

(a) A Quality Engineer has set the following characteristic for these widgets:

Inspection level : II

AQL: 4.0%

The supplier ships 8000 widgets in a lot. The lot history says should use normal inspection, tightened, reduce for this lot. Determine the sample size, accept and reject number.

(9 marks)

(b) Grills Radio Products purchases transistors from Delt Electronics. According to the sampling plan, Art Grills, owner of Grills Radio, will accept a shipment of transistors if 2 or fewer are defective in a sample of 25. Develop an OC curve for these percent defective: 10%, 20%, 30% and 40%.

(12 marks)

(c) 100% inspection is one of alternative method to acceptance sampling. Explain the for the company implement the 100% inspection

(4 marks)

Question 4

(a) Two ice cream packing machines at the Soda Company are being evaluated for their capability. The following data are recorded:

Table 2: The standard deviation for packing machine

Packing Machine	Standard Deviation
AB	0.025
CD	0.078

If specifications are set between 15.8 and 16.2 ounces and the mean are 16, determine which one of the machines are capable of producing within specifications.

(10 marks)

(b) A. Michelson measured the velocity of light in air using a modification of a method proposed by the French physicist Foucauld. 20 of these measurements are in Table 3 below. Set up a control chart for the moving range and a control chart for individual hardness measurements

Table 3: Velocity of light Data

Measurement	Velocity	Measurement	Velocity
1	850	11	850
2	1000	12	810
3	740	13	950
4	980	14	1000
5	900	15	980
6	930	16	1000
7	1070	17	980
8	650	18	960
9	930	19	880
10	760	20	960

(15 marks)

Question 5

A control chart is used to control the fraction nonconforming for a plastic part manufactured in an injection molding process. 10 subgroups yield the data are in Table 4 below:

Table 4: Nonconforming Unit for plastic part manufactured

Sample	Sample Size	Number Nonconforming
1	100	10
2	100	15
3	100	31
4	100	18
5	100	24
6	100	12
7	100	23
8	100	15
9	100	8
10	100	8

(a) Compute the value of fraction nonconforming

(5 marks)

(b) Does the process appear to be in control? (Use graph paper)

(20 marks)

END OF EXAMINATION PAPER

Appendix A:

Mean	$\bar{x} = \frac{\sum x_i}{n}$
Standard Deviation	$s = \sqrt{\frac{\sum \left(x_i - \bar{x} \right)^2}{n-1}}$
Median	$Median = \frac{n+1}{2} th$
First Quartile	$Q_1 = \frac{(n+1)}{4} th$
Third Quartile	$Q_3 = \frac{3(n+1)}{4} th$
Range	**Max – Min**
InterQuartile Range	**Quartile 3- Quartile 1**

General Model for Control Chart

$$UCL = \mu_w + k\sigma_w$$

$$CL = \mu_w$$

$$LCL = \mu_w - k\sigma_w$$

$$k = distance$$

$$\sigma_w = \frac{\sigma}{\sqrt{n}}$$

Variable Data :

X-bar Chart

$$UCL = \bar{\bar{x}} + A_2 \bar{R}$$

$$CL = \bar{\bar{x}}$$

$$LCL = \bar{\bar{x}} - A_2 \bar{R}$$

R Chart

$$UCL = \bar{R} D_4$$

$$CL = \bar{R}$$

$$LCL = \bar{R} D_3$$

X-bar Chart

$$UCL = \bar{\bar{x}} + A_3 \bar{s}$$

$$CL = \bar{\bar{x}}$$

$$LCL = \bar{\bar{x}} - A_3 \bar{s}$$

S Chart

$$UCL = B_4 \bar{s}$$

$$CL = \bar{s}$$

$$LCL = B_3 \bar{s}$$

X Chart

$$UCL = \bar{\bar{X}} + \frac{3\,\bar{MR}}{d_2}$$

$$CL = \bar{\bar{X}} = \frac{\sum_{i=1}^{m} X_i}{m}$$

$$LCL = \bar{\bar{X}} + \frac{3\,\bar{MR}}{d_2}$$

MR Chart

$$UCL = D_4\,\bar{MR}$$

$$CL = \bar{MR} = \frac{\sum_{i=2}^{m} MR_i}{m-1}$$

$$LCL = D_3\,\bar{MR}$$

Standard Deviation

$$\sigma = \frac{\bar{R}}{d_2}$$

Capability

$$C_p = \frac{USL - LSL}{6\sigma}$$

$$C_{pk} = \min\left[\frac{USL - \bar{X}}{3\sigma}, \frac{\bar{X} - LSL}{3\sigma}\right]$$

Attribute chart:

P Chart

$$UCL = \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

$$CL = \bar{p}$$

$$LCL = \bar{p} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

Np Chart

$$UCL = \bar{N} + 3\sqrt{\bar{N}\,\frac{(1-\bar{N})}{n}}$$

$$CL = \bar{N}$$

$$LCL = \bar{N} - 3\sqrt{\bar{N}\,\frac{(1-\bar{N})}{n}}$$

C Chart

$$UCL = \bar{c} + 3\sqrt{\bar{c}}$$

$$CL = \bar{c}$$

$$LCL = \bar{c} - 3\sqrt{\bar{c}}$$

U Chart

$$UCL = \bar{U} + 3\sqrt{\frac{\bar{U}}{n}}$$

$$CL = \bar{U}$$

$$LCL = \bar{U} - 3\sqrt{\frac{\bar{U}}{n}}$$

Binomial Distribution

$$f(x) = \binom{n}{x} p^x (1-p)^{n-x}$$

Appendix B

Factors for Constructing Variables Control Charts

Observations in Sample, n	Chart for Averages: Factors for Control Limits A	A_2	A_3	Chart for Averages: Factors for Center Line c_4	$1/c_4$	Chart for Standard Deviations: Factors for Control Limits B_3	B_4	B_5	B_6	Factors for Center Line d_2	$1/d_2$	Chart for Ranges: Factors for Control Limits d_3	D_1	D_2	D_3	D_4
2	2.121	1.880	2.659	0.7979	1.2533	0	3.267	0	2.606	1.128	0.8865	0.853	0	3.686	0	3.267
3	1.732	1.023	1.954	0.8862	1.1284	0	2.568	0	2.276	1.693	0.5907	0.888	0	4.358	0	2.574
4	1.500	0.729	1.628	0.9213	1.0854	0	2.266	0	2.088	2.059	0.4857	0.880	0	4.698	0	2.282
5	1.342	0.577	1.427	0.9400	1.0638	0	2.089	0	1.964	2.326	0.4299	0.864	0	4.918	0	2.114
6	1.225	0.483	1.287	0.9515	1.0510	0.030	1.970	0.029	1.874	2.534	0.3946	0.848	0	5.078	0	2.004
7	1.134	0.419	1.182	0.9594	1.0423	0.118	1.882	0.113	1.806	2.704	0.3698	0.833	0.204	5.204	0.076	1.924
8	1.061	0.373	1.099	0.9650	1.0363	0.185	1.815	0.179	1.751	2.847	0.3512	0.820	0.388	5.306	0.136	1.864
9	1.000	0.337	1.032	0.9693	1.0317	0.239	1.761	0.232	1.707	2.970	0.3367	0.808	0.547	5.393	0.184	1.816
10	0.949	0.308	0.975	0.9727	1.0281	0.284	1.716	0.276	1.669	3.078	0.3249	0.797	0.687	5.469	0.223	1.777
11	0.905	0.285	0.927	0.9754	1.0252	0.321	1.679	0.313	1.637	3.173	0.3152	0.787	0.811	5.535	0.256	1.744
12	0.866	0.266	0.886	0.9776	1.0229	0.354	1.646	0.346	1.610	3.258	0.3069	0.778	0.922	5.594	0.283	1.717
13	0.832	0.249	0.850	0.9794	1.0210	0.382	1.618	0.374	1.585	3.336	0.2998	0.770	1.025	5.647	0.307	1.693
14	0.802	0.235	0.817	0.9810	1.0194	0.406	1.594	0.399	1.563	3.407	0.2935	0.763	1.118	5.696	0.328	1.672
15	0.775	0.223	0.789	0.9823	1.0180	0.428	1.572	0.421	1.544	3.472	0.2880	0.756	1.203	5.741	0.347	1.653
16	0.750	0.212	0.763	0.9835	1.0168	0.448	1.552	0.440	1.526	3.532	0.2831	0.750	1.282	5.782	0.363	1.637
17	0.728	0.203	0.739	0.9845	1.0157	0.466	1.534	0.458	1.511	3.588	0.2787	0.744	1.356	5.820	0.378	1.622
18	0.707	0.194	0.718	0.9854	1.0148	0.482	1.518	0.475	1.496	3.640	0.2747	0.739	1.424	5.856	0.391	1.608
19	0.688	0.187	0.698	0.9862	1.0140	0.497	1.503	0.490	1.483	3.689	0.2711	0.734	1.487	5.891	0.403	1.597
20	0.671	0.180	0.680	0.9869	1.0133	0.510	1.490	0.504	1.470	3.735	0.2677	0.729	1.549	5.921	0.415	1.585
21	0.655	0.173	0.663	0.9876	1.0126	0.523	1.477	0.516	1.459	3.778	0.2647	0.724	1.605	5.951	0.425	1.575
22	0.640	0.167	0.647	0.9882	1.0119	0.534	1.466	0.528	1.448	3.819	0.2618	0.720	1.659	5.979	0.434	1.566
23	0.626	0.162	0.633	0.9887	1.0114	0.545	1.455	0.539	1.438	3.858	0.2592	0.716	1.710	6.006	0.443	1.557
24	0.612	0.157	0.619	0.9892	1.0109	0.555	1.445	0.549	1.429	3.895	0.2567	0.712	1.759	6.031	0.451	1.548
25	0.600	0.153	0.606	0.9896	1.0105	0.565	1.435	0.559	1.420	3.931	0.2544	0.708	1.806	6.056	0.459	1.541

Appendix C

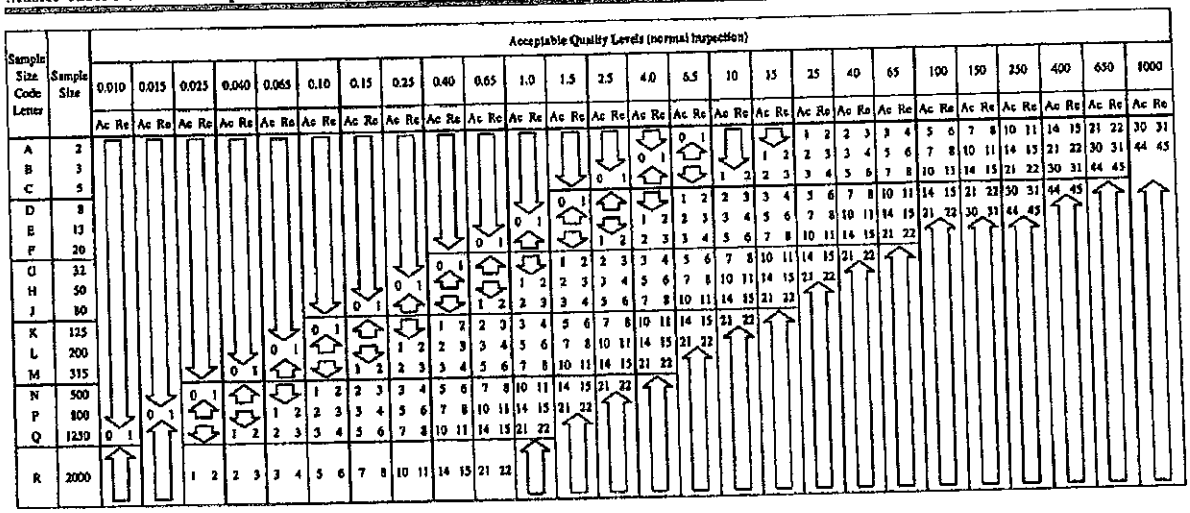
TABLE 15.4

Sample Size Code Letters (MIL STD 105E, Table I)

Lot or Batch Size	Special Inspection Levels				General Inspection Levels		
	S-1	S-2	S-3	S-4	I	II	III
2 to 8	A	A	A	A	A	A	B
9 to 15	A	A	A	A	A	B	C
16 to 25	A	A	B	B	B	C	D
26 to 50	A	B	B	C	C	D	E
51 to 90	B	B	C	C	C	E	F
91 to 150	B	B	C	D	D	F	G
151 to 280	B	C	D	E	E	G	H
281 to 500	B	C	D	E	F	H	J
501 to 1200	C	C	E	F	G	J	K
1201 to 3200	C	D	E	G	H	K	L
3201 to 10000	C	D	F	G	J	L	M
10001 to 35000	C	D	F	H	K	M	N
35001 to 150000	D	E	G	J	L	N	P
150001 to 500000	D	E	G	J	M	P	Q
500001 and over	D	E	H	K	N	Q	R

Appendix D

Master Table for Normal Inspection for Single-Sampling (U.S. Dept. of Defense MIL STD 105E, Table II-A)



⇩ = Use first sampling plan below arrow. If sample size equals, or exceeds, lot or batch size, do 100% inspection.

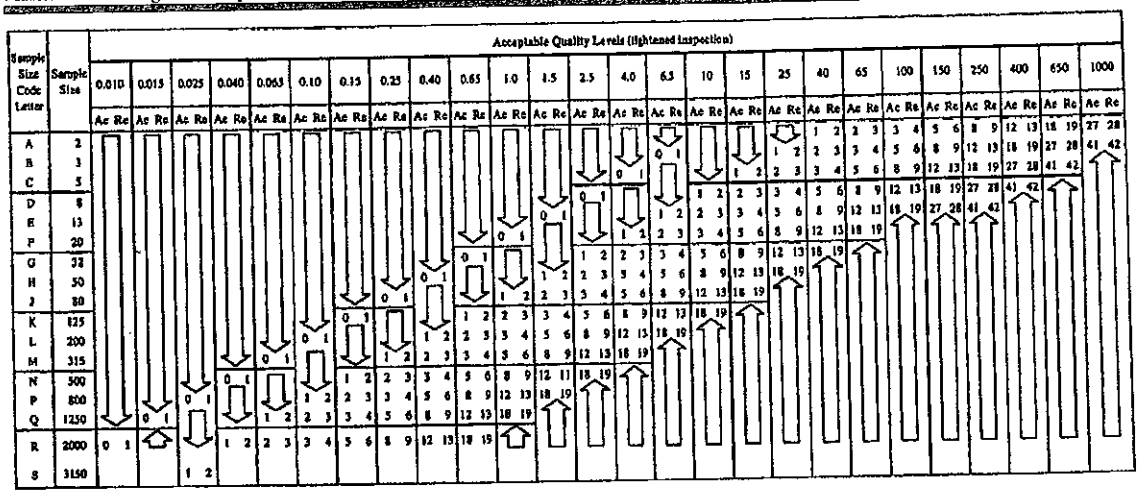
⇧ = Use first sampling plan above arrow.

Ac = Acceptance number.

Re = Rejection number.

Appendix E

Master Table for Tightened Inspection—Single-Sampling (U.S. Dept. of Defense MIL STD 105E, Table II-B)



Sample Size Code Letter	Sample Size	Acceptable Quality Levels (tightened inspection)																																					
		0.010		0.015		0.025		0.040		0.065		0.10		0.15		0.25		0.40		0.65		1.0		1.5		2.5		4.0		6.5		10		15		25		40		65		100	
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
A	2																																			1	2	2	3	3	4
B	3																																			1	2	2	3	3	4
C	5																																			1	2	2	3	3	4
D	8																																			1	2	2	3	3	4
E	13																																			1	2	2	3	3	4
F	20																																			1	2	2	3	3	4
G	32																																			1	2	2	3	3	4
H	50																																			1	2	2	3	3	4
J	80																																			1	2	2	3	3	4
K	125																																			1	2	2	3	3	4
L	200																																			1	2	2	3	3	4
M	315																																			1	2	2	3	3	4
N	500																																			1	2	2	3	3	4
P	800																																			1	2	2	3	3	4
Q	1250																																			1	2	2	3	3	4
R	2000																																			1	2	2	3	3	4
S	3150																																			1	2	2	3	3	4

Sample Size Code Letter	Sample Size	Acceptable Quality Levels (tightened inspection)																																					
		100		150		250		400		650		1000																													
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re																												
A	2	3	4	5	6	8	9	12	13	18	19	27	28																												
B	3	5	6	8	9	12	13	18	19	27	28	41	42																												
C	5	8	9	12	13	18	19	27	28	41	42																														
D	8	12	13	18	19	27	28	41	42																																
E	13	18	19	27	28	41	42																																		
F	20	18	19																																						
G	32																																								
H	50																																								
J	80																																								
K	125																																								
L	200																																								
M	315																																								
N	500																																								
P	800																																								
Q	1250																																								
R	2000																																								
S	3150																																								

= Use first sampling plan below arrow. If sample size equals, or exceeds, lot or batch size, do 100% inspection.

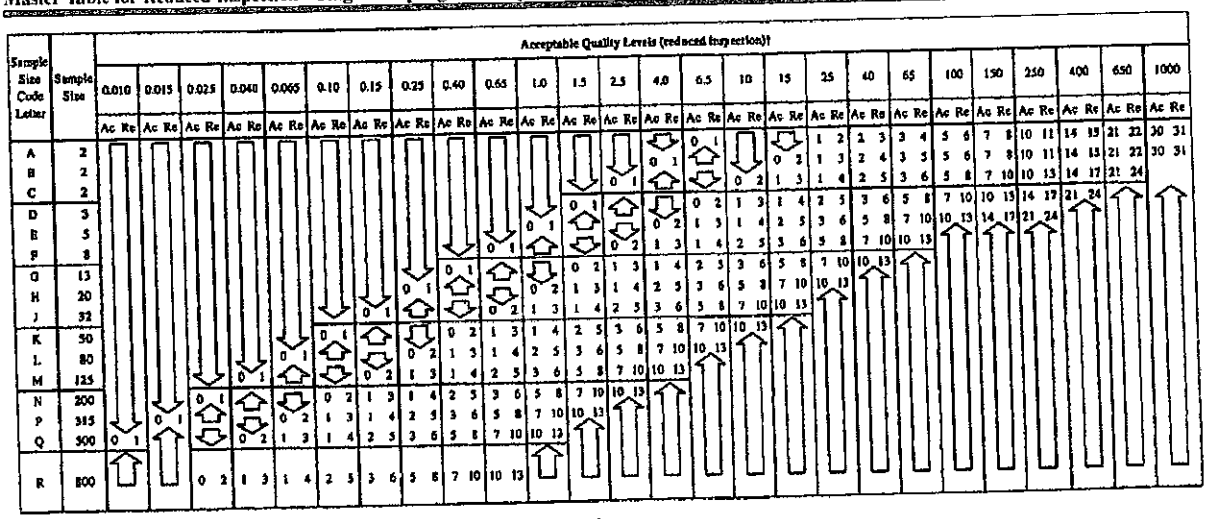
= Use first sampling plan above arrow.

Ac = Acceptance number.

Re = Rejection number.

Appendix F

Master Table for Reduced Inspection—Single-Sampling (U.S. Dept. of Defense MIL STD 105E, Table II-C)



Sample Size Code Letter	Sample Size	Acceptable Quality Levels (reduced inspection)†																																					
		0.010		0.015		0.025		0.040		0.065		0.10		0.15		0.25		0.40		0.65		1.0		1.5		2.5		4.0		6.5		10		15		25		40		65		100	
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
A	2																																			1	2	2	3	3	4
B	2																																			1	2	2	3	3	4
C	2																																			1	2	2	3	3	4
D	3																																			1	2	2	3	3	4
E	5																																			1	2	2	3	3	4
F	8																																			1	2	2	3	3	4
G	13																																			1	2	2	3	3	4
H	20																																			1	2	2	3	3	4
J	32																																			1	2	2	3	3	4
K	50																																			1	2	2	3	3	4
L	80																																			1	2	2	3	3	4
M	125																																			1	2	2	3	3	4
N	200																																			1	2	2	3	3	4
P	315																																			1	2	2	3	3	4
Q	500																																			1	2	2	3	3	4
R	800																																			1	2	2	3	3	4

Sample Size Code Letter	Sample Size	Acceptable Quality Levels (reduced inspection)†																																					
		100		150		250		400		650		1000																													
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re																												
A	2	5	6	7	8	10	11	15	16	21	22	30	31																												
B	2	5	6	7	8	10	11	14	15	21	22	30	31																												
C	2	5	6	7	8	10	11	14	15	21	22																														
D	3	5	6	7	8	10	11	14	15	21	22																														
E	5	5	6	7	8	10	11	14	15	21	22																														
F	8	5	6	7	8	10	11	14	15	21	22																														
G	13	5	6	7	8	10	11	14	15	21	22																														
H	20	5	6	7	8	10	11	14	15	21	22																														
J	32	5	6	7	8	10	11	14	15	21	22																														
K	50	5	6	7	8	10	11	14	15	21	22																														
L	80	5	6	7	8	10	11	14	15	21	22																														
M	125	5	6	7	8	10	11	14	15	21	22																														
N	200	5	6	7	8	10	11	14	15	21	22																														
P	315	5	6	7	8	10	11	14	15	21	22																														
Q	500	5	6	7	8	10	11	14	15	21	22																														
R	800	5	6	7	8	10	11	14	15	21	22																														

= Use first sampling plan below arrow. If sample size equals, or exceeds, lot or batch size, do 100% inspection.

= Use first sampling plan above arrow.

Ac = Acceptance number.

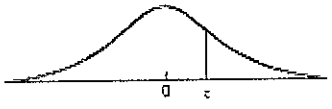
Re = Rejection number.

† = If the acceptance number has been exceeded, but the rejection number has not been reached, accept the lot, but reinstate normal inspection.

Appendix G

Cumulative Standard Normal Distribution

$$\Phi(z) = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} e^{-u^2/2} du$$



z	0.00	0.01	0.02	0.03	0.04	z
0.0	0.50000	0.50399	0.50798	0.51197	0.51595	0.0
0.1	0.53983	0.54379	0.54776	0.55172	0.55567	0.1
0.2	0.57926	0.58317	0.58706	0.59095	0.59483	0.2
0.3	0.61791	0.62172	0.62551	0.62930	0.63307	0.3
0.4	0.65542	0.65910	0.62276	0.66640	0.67003	0.4
0.5	0.69146	0.69497	0.69847	0.70194	0.70540	0.5
0.6	0.72575	0.72907	0.73237	0.73565	0.73891	0.6
0.7	0.75803	0.76115	0.76424	0.76730	0.77035	0.7
0.8	0.78814	0.79103	0.79389	0.79673	0.79954	0.8
0.9	0.81594	0.81859	0.82121	0.82381	0.82639	0.9
1.0	0.84134	0.84375	0.84613	0.84849	0.85083	1.0
1.1	0.86433	0.86650	0.86864	0.87076	0.87285	1.1
1.2	0.88493	0.88686	0.88877	0.89065	0.89251	1.2
1.3	0.90320	0.90490	0.90658	0.90824	0.90988	1.3
1.4	0.91924	0.92073	0.92219	0.92364	0.92506	1.4
1.5	0.93319	0.93448	0.93574	0.93699	0.93822	1.5
1.6	0.94520	0.94630	0.94738	0.94845	0.94950	1.6
1.7	0.95543	0.95637	0.95728	0.95818	0.95907	1.7
1.8	0.96407	0.96485	0.96562	0.96637	0.96711	1.8
1.9	0.97128	0.97193	0.97257	0.97320	0.97381	1.9
2.0	0.97725	0.97778	0.97831	0.97882	0.97932	2.0
2.1	0.98214	0.98257	0.98300	0.98341	0.98382	2.1
2.2	0.98610	0.98645	0.98679	0.98713	0.98745	2.2
2.3	0.98928	0.98956	0.98983	0.99010	0.99036	2.3
2.4	0.99180	0.99202	0.99224	0.99245	0.99266	2.4
2.5	0.99379	0.99396	0.99413	0.99430	0.99446	2.5
2.6	0.99534	0.99547	0.99560	0.99573	0.99585	2.6
2.7	0.99653	0.99664	0.99674	0.99683	0.99693	2.7
2.8	0.99744	0.99752	0.99760	0.99767	0.99774	2.8
2.9	0.99813	0.99819	0.99825	0.99831	0.99836	2.9
3.0	0.99865	0.99869	0.99874	0.99878	0.99882	3.0
3.1	0.99903	0.99906	0.99910	0.99913	0.99916	3.1
3.2	0.99931	0.99934	0.99936	0.99938	0.99940	3.2
3.3	0.99952	0.99953	0.99955	0.99957	0.99958	3.3
3.4	0.99966	0.99968	0.99969	0.99970	0.99971	3.4
3.5	0.99977	0.99978	0.99978	0.99979	0.99980	3.5
3.6	0.99984	0.99985	0.99985	0.99986	0.99986	3.6
3.7	0.99989	0.99990	0.99990	0.99990	0.99991	3.7
3.8	0.99993	0.99993	0.99993	0.99994	0.99994	3.8
3.9	0.99995	0.99995	0.99996	0.99996	0.99996	3.9

Cumulative Standard Normal Distribution *(continued)*

$$\Phi(z) = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} e^{-u^2/2} du$$

z	0.05	0.06	0.07	0.08	0.09	z
0.0	0.51994	0.52392	0.52790	0.53188	0.53586	0.0
0.1	0.55962	0.56356	0.56749	0.57142	0.57534	0.1
0.2	0.59871	0.60257	0.60642	0.61026	0.61409	0.2
0.3	0.63683	0.64058	0.64431	0.64803	0.65173	0.3
0.4	0.67364	0.67724	0.68082	0.68438	0.68793	0.4
0.5	0.70884	0.71226	0.71566	0.71904	0.72240	0.5
0.6	0.74215	0.74537	0.74857	0.75175	0.75490	0.6
0.7	0.77337	0.77637	0.77935	0.78230	0.78523	0.7
0.8	0.80234	0.80510	0.80785	0.81057	0.81327	0.8
0.9	0.82894	0.83147	0.83397	0.83646	0.83891	0.9
1.0	0.85314	0.85543	0.85769	0.85993	0.86214	1.0
1.1	0.87493	0.87697	0.87900	0.88100	0.88297	1.1
1.2	0.89435	0.89616	0.89796	0.89973	0.90147	1.2
1.3	0.91149	0.91308	0.91465	0.91621	0.91773	1.3
1.4	0.92647	0.92785	0.92922	0.93056	0.93189	1.4
1.5	0.93943	0.94062	0.94179	0.94295	0.94408	1.5
1.6	0.95053	0.95154	0.95254	0.95352	0.95448	1.6
1.7	0.95994	0.96080	0.96164	0.96246	0.96327	1.7
1.8	0.96784	0.96856	0.96926	0.96995	0.97062	1.8
1.9	0.97441	0.97500	0.97558	0.97615	0.97670	1.9
2.0	0.97982	0.98030	0.98077	0.98124	0.98169	2.0
2.1	0.98422	0.98461	0.98500	0.98537	0.98574	2.1
2.2	0.98778	0.98809	0.98840	0.98870	0.98899	2.2
2.3	0.99061	0.99086	0.99111	0.99134	0.99158	2.3
2.4	0.99286	0.99305	0.99324	0.99343	0.99361	2.4
2.5	0.99461	0.99477	0.99492	0.99506	0.99520	2.5
2.6	0.99598	0.99609	0.99621	0.99632	0.99643	2.6
2.7	0.99702	0.99711	0.99720	0.99728	0.99736	2.7
2.8	0.99781	0.99788	0.99795	0.99801	0.99807	2.8
2.9	0.99841	0.99846	0.99851	0.99856	0.99861	2.9
3.0	0.99886	0.99889	0.99893	0.99897	0.99900	3.0
3.1	0.99918	0.99921	0.99924	0.99926	0.99929	3.1
3.2	0.99942	0.99944	0.99946	0.99948	0.99950	3.2
3.3	0.99960	0.99961	0.99962	0.99964	0.99965	3.3
3.4	0.99972	0.99973	0.99974	0.99975	0.99976	3.4
3.5	0.99981	0.99981	0.99982	0.99983	0.99983	3.5
3.6	0.99987	0.99987	0.99988	0.99988	0.99989	3.6
3.7	0.99991	0.99992	0.99992	0.99992	0.99992	3.7
3.8	0.99994	0.99994	0.99995	0.99995	0.99995	3.8
3.9	0.99996	0.99996	0.99996	0.99997	0.99997	3.9