LAMPIRAN 1

Time to Failure (TTF)

1. TTF Cutter

No	Bulan	Tanggal	Waktu Mulai	Waktu Selesai	TTF (jam)
1	Januari	08-01-15	11:00	11:20	0
2	Maret	27-03-15	10:30	10:45	468.58
3	April	29-04-15	13:00	14:00	199.25
4	Mei	19-05-15	9:00	9:20	121.33
5	Juli	27-07-15	10:15	10:35	414.67
6	September	01-09-15	13:00	13:20	216.67
7	Oktober	27-10-15	10:00	10:20	336.67
8	Desember	19-12-15	10:00	10:25	318.75

2. TTF Heater Catridge

No	Bulan	Tanggal	Waktu Mulai	Waktu Selesai	TTF (jam)
1	Januari	30-01-15	11:00	11:30	0
2	April	10-04-15	10:00	10:45	421.25
3	Mei	18-05-15	10:00	10:45	229.5
4	Agustus	26-08-15	9:20	9:50	601.25
5	Oktober	08-10-15	12:00	12:45	259.25
6	Desember	10-12-15	12:30	13:15	379.5

3. TTF Thermo Couple

No	Bulan	Tanggal	Waktu Mulai	Waktu Selesai	TTF (jam)
1	Februari	04-02-15	12:00	12:45	0
2	Maret	07-03-15	11:00	11:45	187.5
3	Juni	16-06-15	12:00	12:45	607.5
4	Agustus	11-08-15	8:30	9:20	337.58
5	Oktober	05-10-15	8:45	9:30	331.58
6	November	24-11-15	11:00	11:45	301.5

4. TTF Disc Heater

No	Bulan	Tanggal	Waktu Mulai	Waktu Selesai	TTF (jam)
1	Januari	27-01-15	9:00	10:30	0
2	Maret	10-03-15	8:15	9:45	255
3	Juni	10-06-15	10:30	12:00	555
4	September	18-09-15	8:00	9:30	603
5	November	17-11-15	11:00	12:30	363

5. TTF *Spring*

No	Bulan	Tanggal	Waktu Mulai	Waktu Selesai	TTF (jam)
1	Februari	16-02-15	10:00	10:20	0
2	Mei	21-05-15	11:00	11:30	564.83
3	Agustus	03-08-15	9:00	9:50	445.33
4	Oktober	24-10-15	9:30	9:50	493.17

LAMPIRAN 2

Interpolasi

$$Rumus\ Interpolasi = \frac{\big((ba - F(ti)) \times tb\big) + \big((F(ti) - bb) \times ta\big)}{\big(ba - F(ti)\big) + (F(ti) - bb)}$$

1. Interpolasi nilai F(t_i) komponen Silinder *Cutter* untuk distribusi normal dan lognormal

F(ti)	ba	bb	ta	tb	nilai tabel
0.0454545	0.0455	0.0445655	-1.69	-1.7	-1.6906266
0.1103896	0.1112324	0.1093486	-1.22	-1.23	-1.2244739
0.1753247	0.1761855	0.1736088	-0.93	-0.92	-0.9266591
0.2402597	0.2419637	0.2388521	-0.7	-0.71	-0.705476
0.3051948	0.3085	0.3050	-0.5	-0.51	-0.5095186
0.3701299	0.3707	0.3669283	-0.33	-0.34	-0.3315115
0.4350649	0.4364405	0.4325051	-0.16	-0.17	-0.1634954
0.5	0	0	0	0	0
0.5649351	0.5674949	0.5635595	0.17	0.16	0.1634954
0.6298701	0.6330717	0.6293	0.34	0.33	0.3315115
0.6948052	0.6949743	0.6914625	0.51	0.5	0.5095186
0.7597403	0.7611479	0.7580363	0.71	0.7	0.705476
0.8246753	0.8263912	0.8238145	0.94	0.93	0.9333409
0.8896104	0.8906514	0.8887676	1.23	1.22	1.2244739
0.9545455	0.9554345	0.954486	1.7	1.69	1.6906266

2. Interpolasi nilai F(t_i) komponen Silinder *Heater* untuk distribusi normal dan lognormal

F(ti)	ba	bb	ta	tb	nilai tabel
0.0673	0.0681	0.0668	-1.49	-1.50	-1.49616
0.1635	0.1635	0.1611	-0,98	-0,99	-0.98
0.2596	0.2611	0.2578	-0.64	-0.65	-0.64454
0.3558	0.3594	0.3557	-0.36	-0.37	-0.36979
0.4519	0.4522	0.4483	-0.12	-0.13	-0.1208
0.5481	0.5517	0.5478	0.13	0.12	0.120805
0.6442	0.6443	0.6406	0.37	0.36	0.369791
0.7404	0.7422	0.7389	0.65	0.64	0.64454
0.8365	0.8365	0.8340	0.98	0.97	0.98
0.9327	0.9332	0.9319	1.50	1.49	1.496165

3. Interpolasi nilai F(t_i) komponen Silinder *Feeding* untuk distribusi normal dan lognormal

F(ti)	ba	bb	ta	tb	nilai tabel
0.0833	0.083793	0.082264	-1.38	-1.39	-1.38301
0.2024	0.2033	0.2005	-0.83	-0.84	-0.83316
0.3214	0.322758	0.319178	-0.46	-0.47	-0.46371

F(ti)	ba	bb	ta	tb	nilai tabel
0.4405	0.44433	0.440382	-0.14	-0.15	-0.14976
0.5595	0.559618	0.55567	0.15	0.14	0.149762
0.6786	0.680822	0.677242	0.47	0.46	0.463713
0.7976	0.799546	0.796731	0.84	0.83	0.833156
0.9167	0.917736	0.916207	1.39	1.38	1.383009

4. Interpolasi nilai $F(t_i)$ komponen *Cutter* untuk distribusi normal dan lognormal

F(ti)	ba	bb	ta	tb	nilai tabel
0.095	0.0951	0.0934	-1.31	-1.32	-1.313
0.230	0.2327	0.2296	-0.73	-0.74	-0.740
0.365	0.3669	0.3632	-0.34	-0.35	-0.345
0.500	0	0	0	0	0.000
0.635	0.6368	0.6331	0.35	0.34	0.345
0.770	0.7704	0.7673	0.74	0.73	0.740
0.905	0.9066	0.9049	1.32	1.31	1.313

5. Interpolasi nilai $F(t_i)$ komponen *Heater Catridge* untuk distribusi normal dan lognormal

F(ti)	ba	bb	ta	tb	nilai tabel
0.130	0.1314	0.1292	-1.12	-1.13	-1.128
0.315	0.3156	0.3121	-0.48	-0.49	-0.482
0.500	0	0	0	0	0
0.685	0.6879	0.6844	0.49	0.48	0.482
0.870	0.8729	0.8708	1.14	1.13	1.128

6. Interpolasi nilai $F(t_i)$ komponen *Thermo Couple* untuk distribusi normal dan lognormal

F(ti)	ba	bb	ta	tb	nilai tabel
0.130	0.131357	0.129238	-1.12	-1.13	-1.128
0.315	0.315614	0.312067	-0.48	-0.49	-0.482
0.500	0	0	0	0	0
0.685	0.687933	0.684386	0.49	0.48	0.482
0.870	0.870762	0.868643	1.13	1.12	1.128

7. Interpolasi nilai $F(t_i)$ komponen untuk *Disc Heater* distribusi normal dan lognormal

F(ti)	ba	bb	ta	tb	nilai tabel
0.159	0.161087	0.158655	-0.99	-1	-0.998
0.386	0.389739	0.385908	-0.28	-0.29	-0.289
0.614	0.614092	0.610261	0.29	0.28	0.289
0.841	0.841345	0.838913	1	0.99	0.998

8. Interpolasi nilai $F(t_i)$ komponen *Spring* untuk distribusi normal dan lognormal

F(ti)	ba	bb	ta	tb	nilai tabel
0.2059	0.206108	0.203269	-0.82	-0.83	-0.8208
0.5	0	0	0	0	0
0.7941	0.796731	0.793892	0.83	0.82	0.8208

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LAMPIRAN 3

Perhitungan Index of Fit Distribusi Normal Manual

1. Perhitungan Index of Fit Distribusi Normal Manual Komponen *Cutter*

i	t_i	xi	F(ti)	zi	xi .zi	xi^2	zi^2
1	121.33	121.33	0.095	-1.313	-159.3101	14721.778	1.724
2	199.25	199.25	0.230	-0.740	-147.3928	39700.563	0.547
3	216.67	216.67	0.365	-0.345	-74.85603	46944.444	0.119
4	318.75	318.75	0.500	0.000	0	101601.563	0.000
5	336.67	336.67	0.635	0.345	116.3147	113344.444	0.119
6	414.67	414.67	0.770	0.740	306.7448	171948.444	0.547
7	468.58	468.58	0.905	1.313	615.2477	219570.340	1.724
Total	2075.92	2075.92	3.50	0	656.75	707831.58	4.78

r = 0,989

2. Perhitungan Index of Fit Distribusi Normal Manual Komponen Heater *Catridge*

i	t_i	xi	F(ti)	Zi	xi .zi	xi^2	zi^2
1	229.5	229.5	0.130	-1.128	-258.91092	52670.25	1.273
2	259.25	259.25	0.315	-0.482	-125.02394	67210.5625	0.233
3	379.5	379.5	0.500	0	0	144020.25	0
4	421.25	421.25	0.685	0.482	203.149	177451.5625	0.233
5	601.25	601.25	0.870	1.128	678.289	361501.5625	1.273
Total	1890.75	1890.75	2.5	0	497.50283	802854.1875	3.010542

r = 0,967

3. Perhitungan Index of Fit Distribusi Normal Manual Komponen *Thermo Couple*

i	t_i	xi	F(ti)	zi	xi .zi	xi^2	zi^2
1	187.5	187.5	0.130	-1.128	-211.529	35156.25	1.273
2	301.5	301.5	0.315	-0.482	-145.399	90902.25	0.233
3	331.58	331.5833	0.500	0	0	109947.507	0
4	337.58	337.5833	0.685	0.482	162.800	113962.507	0.233
5	607.5	607.5	0.870	1.128	685.352	369056.25	1.273
Total	1765.67	1765.667	2.5	0	491.2252	719024.764	3.010589

r = 0,916

4. Perhitungan Index of Fit Distribusi Normal Manual Komponen *Disc Heater*

i	t_i	xi	F(ti)	zi	xi .zi	xi^2	zi^2
1	255	255	0.159	-0.998	-254.54	65025	0.996
2	363	363	0.386	-0.289	-104.84	131769	0.083
3	555	555	0.614	0.289	160.29	308025	0.083
4	603	603	0.841	0.998	601.92	363609	0.996
Total	1776	1776	2	0	402.83	868428	2.160

r = 0,969

5. Perhitungan Index of Fit Distribusi Normal Manual Komponen *Spring*

i	t_i	xi	F(ti)	zi	xi .zi	xi^2	zi^2
1	445.33	445.33	0.2059	-0.8208	-365.5274	198321.8	0.6737
2	493.17	493.17	0.5	0	0	243213.4	0
3	564.83	564.83	0.7941	0.8208	463.6124	319036.7	0.6737
Total	1503.33	1503.33	1.50	0	98.09	760571.8	1.35

r = 0,993

LAMPIRAN 4

Perhitungan Index of Fit Distribusi Lognormal Manual

1. Perhitungan Index of Fit Distribusi Lognormal Manual Komponen *Cutter*

i	t_i	xi	F(ti)	zi	xi .zi	xi^2	zi^2
1	121.33	4.799	0.095	-1.313	-6.300	23.026	1.724
2	199.25	5.295	0.230	-0.740	-3.917	28.032	0.547
3	216.67	5.378	0.365	-0.345	-1.858	28.927	0.119
4	318.75	5.764	0.5	0	0	33.228	0
5	336.67	5.819	0.635	0.345	2.010	33.862	0.119
6	414.67	6.027	0.770	0.740	4.459	36.330	0.547
7	468.58	6.150	0.905	1.313	8.075	37.819	1.724
Total	2075.917	39.23215	3.5	0	2.468516	221.2248	4.781063885

r = 0,973

2. Perhitungan Index of Fit Distribusi Lognormal Manual Komponen *Heater Catridge*

i	t_i	xi	F(ti)	zi	xi .zi	xi^2	zi^2
1	229.5	5.436	0.130	-1.128	-6.133	29.549	1.273
2	259.25	5.558	0.315	-0.482	-2.680	30.889	0.233
3	379.5	5.939	0.500	0	0	35.270	0
4	421.25	6.043	0.685	0.482	2.914	36.521	0.233
5	601.25	6.399	0.870	1.128	7.219	40.947	1.273
Total	1890.75	29.37479	2.5	0	1.3204993	173.1760228	3.010542

r = 0,982

3. Perhitungan Index of Fit Distribusi Lognormal Manual Komponen *Thermo Couple*

i	t_i	xi	F(ti)	zi	xi .zi	xi^2	zi^2
1	187.5	5.234	0.130	-1.128	-5.904	27.392	1.273
2	301.5	5.709	0.315	-0.482	-2.753	32.590	0.233
3	331.58	5.804	0.500	0	0	33.685	0
4	337.58	5.822	0.685	0.482	2.808	33.893	0.233
5	607.5	6.409	0.870	1.128	7.231	41.080	1.273
Total	1765.67	28.98	2.50	0	1.38	168.64	3.01

r = 0,950

4. Perhitungan Index of Fit Distribusi Lognormal Manual Komponen *Disc Heater*

i	t_i	xi	F(ti)	zi	xi .zi	xi^2	zi^2
1	255	5.541	0.159	-0.998	-5.531	30.706	0.996
2	363	5.894	0.386	-0.289	-1.702	34.744	0.083
3	555	6.319	0.614	0.289	1.825	39.929	0.083
4	603	6.402	0.841	0.998	6.390	40.985	0.996
Total	1776	24.157	2	0	0.9817	146.36349	2.1597

r = 0,965

5. Perhitungan Index of Fit Distribusi Lognormal Manual Komponen Silinder *Adjusting*

i	t_i	xi	F(ti)	zi	xi .zi	xi^2	zi^2
1	380.25	5.9408	0.2059	-0.8208	-4.876	35.293	0.674
2	416	6.0307	0.5	0	0	36.369	0
3	872	6.7708	0.7941	0.820795	5.557	45.844	0.674
Total	1668.25	18.7423	1.5	0	0.681	117.5062	1.347

r = 0,911

6. Perhitungan Index of Fit Distribusi Lognormal Manual Komponen *Spring*

i	t_i	xi	F(ti)	zi	xi .zi	xi^2	zi^2
1	445.33	6.10	0.2059	-0.8208	-5.006	37.196	0.674
2	493.17	6.20	0.5	0	0	38.451	0
3	564.83	6.34	0.7941	0.8208	5.201	40.152	0.674
Total	1503.33	18.64	1.50	0	0.2	115.80	1.35

r = 0,996

LAMPIRAN 5

Perhitungan Index of Fit Distribusi *Weibull* Manual

1. Perhitungan Index of Fit Distribusi *Weibull* Manual Komponen *Cutter*

i	t_i	xi	F(ti)	yi	xi .yi	xi^2	yi^2
1	121.33	4.799	0.095	-2.309	-11.079	23.026	5.331
2	199.25	5.295	0.230	-1.343	-7.112	28.032	1.804
3	216.67	5.378	0.365	-0.790	-4.248	28.927	0.624
4	318.75	5.764	0.500	-0.367	-2.113	33.228	0.134
5	336.67	5.819	0.635	0.008	0.048	33.862	0.000
6	414.67	6.027	0.770	0.386	2.326	36.330	0.149
7	468.58	6.150	0.905	0.858	5.276	37.819	0.736
Total	2075.92	39.23	3.50	-3.56	-16.90	221.22	8.78

r = 0,989

2. Perhitungan Index of Fit Distribusi *Weibull* Manual Komponen *Heater Catridge*

i	t_i	xi	F(ti)	yi	xi .yi	xi^2	yi^2
1	229.5	5.436	0.130	-1.974	-10.733	29.549	3.898
2	259.25	5.558	0.315	-0.973	-5.406	30.889	0.946
3	379.5	5.939	0.500	-0.367	-2.177	35.270	0.134
4	421.25	6.043	0.685	0.145	0.875	36.521	0.021
5	601.25	6.399	0.870	0.714	4.572	40.947	0.510
Total	1890.75	29.375	2.5	-2.454	-12.869	173.176	5.510

r = 0,964

3. Perhitungan Index of Fit Distribusi *Weibull* Manual Komponen *Thermo Couple*

i	t_i	xi	F(ti)	yi	xi .yi	xi^2	yi^2
1	187.5	5.234	0.130	-1.974	-10.334	27.392	3.898
2	301.5	5.709	0.315	-0.973	-5.553	32.590	0.946
3	331.58	5.804	0.500	-0.367	-2.127	33.685	0.134
4	337.58	5.822	0.685	0.145	0.843	33.893	0.021
5	607.5	6.409	0.870	0.714	4.579	41.080	0.510
Total	1765.67	28.98	2.50	-2.45	-12.59	168.64	5.51

r = 0,940

4. Perhitungan Index of Fit Distribusi *Weibull* Manual Komponen *Disc Heater*

i	t_i	xi	F(ti)	yi	xi .yi	xi^2	yi^2
1	255	5.541	0.159	-1.7529	-9.7132	30.7056	3.0726
2	363	5.894	0.386	-0.7167	-4.2246	34.7440	0.5137

i	t_i	xi	F(ti)	yi	xi .yi	xi^2	yi^2
3	555	6.319	0.614	-0.0503	-0.3176	39.9294	0.0025
4	603	6.402	0.841	0.6088	3.8977	40.9845	0.3707
Total	1776	24.15655	2	-1.91105	-10.35782	146.36349	3.959523

r = 0,979

5. Perhitungan Index of Fit Distribusi *Weibull* Manual Komponen Silinder *Adjusting*

i	t_i	xi	F(ti)	yi	xi .yi	xi^2	yi^2
1	380.25	5.9408	0.2059	-1.467	-8.718	35.293	2.153
2	416	6.0307	0.5	-0.367	-2.210	36.369	0.134
3	872	6.7708	0.7941	0.458	3.099	45.844	0.209
Total	1668.25	18.7423	1.5	-1.3762	-7.82885	117.5062	2.497098

r = 0,873

6. Perhitungan Index of Fit Distribusi *Weibull* Manual Komponen *Spring*

i	t_i	xi	F(ti)	yi	xi .yi	xi^2	yi^2
1	445.33	6.10	0.2059	-1.4674	-8.949424	37.19564	2.153268
2	493.17	6.20	0.5	-0.36651	-2.272691	38.45051	0.134332
3	564.83	6.34	0.7941	0.45771	2.900293	40.15162	0.209498
Total	1503.333	18.6362	1.5	-1.3762	-8.321822	115.7978	2.497098

r = 0,986

LAMPIRAN 6

Perhitungan Index of Fit dengan *Software Minitab*

1. Perhitungan Index of Fit Komponen *Cutter* dengan *Software Minitab*

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Normal	1.771	0.989
Lognormal	1.843	0.974
Weibull	1.774	0.990

Maka berdasarkan perhitungan *software* Minitab 16, distribusi yang terpilih yaitu distribusi weibull dengan nilai *correlation coefficient* sebesar 0,990.

2. Perhitungan Index of Fit Komponen *Heater Catridge* dengan *Software Minitab*

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Normal	2.362	0.967
Lognormal	2.332	0.982
Weibull	2.414	0.965

Maka berdasarkan perhitungan *software* Minitab 16, distribusi yang terpilih yaitu distribusi lognormal dengan nilai *correlation coefficient* sebesar 0,982.

3. Perhitungan Index of Fit Komponen *Thermo Couple* dengan *Software Minitab*

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Normal	2.586	0.916
Lognormal	2.482	0.951
Weibull	2.656	0.940

Maka berdasarkan perhitungan *software* Minitab 16, distribusi yang terpilih yaitu distribusi lognormal dengan nilai *correlation coefficient* sebesar 0,951.

4. Perhitungan Index of Fit Komponen *Disc Heater* dengan *Software Minitab*

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Normal	2.824	0.970
Lognormal	2.841	0.965
Weibull	2.820	0.980

Maka berdasarkan perhitungan *software* Minitab 16, distribusi yang terpilih yaitu distribusi weibull dengan nilai *correlation coefficient* sebesar 0,980.

5. Perhitungan Index of Fit Komponen *Spring* dengan *Software Minitab*

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Normal	3.441	0.993
Lognormal	3.439	0.997
Weibull	3.465	0.987

Maka berdasarkan perhitungan *software* Minitab 16, distribusi yang terpilih yaitu distribusi lognormal dengan nilai *correlation coefficient* sebesar 0,997.

LAMPIRAN 7

Perhitungan Goodness of Fit Komponen

1. Perhitungan Goodness of Fit Komponen *Cutter*

   H_0 = Komponen *Cutter* berdistribusi weibull

   H_1 = Komponen *Cutter* tidak berdistribusi weibull

i	t_i	ln t_i	Z_i	M_i	ln t_{i+1} – ln t_i	(ln t_{i+1} – ln t_i)/ M
1	121.33	4.7985	-5.1704813	1.104332	0.4960	0.449157218
2	199.25	5.2946	-4.0661492	0.516601	0.0838	0.162213812
3	216.67	5.3784	-3.5495486	0.342304	0.3860	1.12779136
4	318.75	5.7644	-3.207245	0.257203	0.0547	0.212618658
5	336.67	5.8191	-2.9500417	0.206618	0.2084	1.008534038
6	414.67	6.0275	-2.7434233	0.173062	0.1222	0.706331199
7	468.58	6.1497	-2.5703615			

$$k1 = \frac{7}{2} = 3.5{\sim}4; \qquad k2 = \frac{7-1}{2} = 3$$

$$Z_i = \ln[-\ln(1 - \frac{i + 0.5}{n + 0.25})] = -5{,}17$$

$$M_i = Z_{i+1} - Z_i$$

$$M_1 = -4{,}06 \ldots - (-5.17 \ldots) = 1{,}104$$

Uji statistiknya adalah sebagai berikut:

$$M = \frac{k1 \sum_{i=k1+1}^{r-1} \left[\frac{lnt_i+1-t_i}{M_i}\right]}{k2 \sum_{i=1}^{k1} \left[\frac{lnt_i+1-t_i}{M_i}\right]} = \frac{4 \sum_{5}^{6} [1.008+0.7063]}{3 \sum_{i=1}^{4} [0.4491+\cdots+0.2126]} = 1{,}314$$

Maka nilai *Mann* yaitu sebesar 1,314. Sedangkan $F_{(0,05;6;8)}$ = 3,581. H_0 diterima apabila nilai M < F tabel. Sehingga pada perhitungan ini H_0 diterima.

2. Perhitungan Goodness of Fit Komponen *Heater Catridge*

   H_0 = Data kerusakan komponen *Heater Catridge* berdistribusi lognormal

   H_1 = Data kerusakan komponen *Heater Catridge* tidak berdistribusi lognormal

i	t_i	$\bar{t}$	$\left(\frac{t_i - t}{s}\right)$	Tabel	D1	D2
1	229.5	45.9	-1.12	0.1314	0.131357	0.068643
2	259.25	51.85	-0.90	0.1841	-0.01594	0.01594
3	379.5	75.9	0.01	0.504	0.103989	-0.30399
4	421.25	84.25	0.33	0.6293	0.0293	-0.4293
5	601.25	120.25	1.68	0.9535	0.153521	-0.75352
Total	1890.75	378.15				

Berikut ini contoh perhitungan *goodness of fit* distribusi normal pada komponen *Heater Catridge*:

$\bar{t} = \sum_{i=1}^{n} \frac{ti}{n} = \frac{45.9}{5} + \cdots + \frac{120.25}{5} = 378.15$

$S^2 = \sum_{i=1}^{n} \frac{(t_1 - \bar{t})^2}{n} = 17573.415$

$S = 132.56476$

Dimana $\frac{t_i - \bar{t}}{s}$ diperoleh dari tabel standar normal dan lognormal.

$D_1 = \max_{1 \le i \le n} \left\{ \Phi \left(\frac{t_{i-t}}{s} \right) - \frac{1-i}{n} \right\} = 0.13521$

$D_2 = \max_{1 \le i \le n} \left\{ \frac{1}{n} - \Phi \left(\frac{t_{i-t}}{s} \right) \right\} = 0.068643$

Jadi nilai *Kolmogorov-smirnov* adalah 0.153521 dimana $D_n = \max\{D_1; D_2\}$. Sedangkan Dtabel ($D_{0.05; 5}$) = 0.563. Maka berdasarkan perhitungan diatas $D_{hitung} < D_{tabel}$ = 0.153521 < 0.563, maka kesimpulannya adalah H_0 diterima yang artinya bahwa data kerusakan komponen *Heater Catridge* berdistribusi lognormal.

3. Perhitungan Goodness of Fit Komponen *Thermo Couple*

H_0 = Data kerusakan komponen *Thermo Couple* berdistribusi lognormal

H_1 = Data kerusakan komponen *Thermo Couple* tidak berdistribusi lognormal

i	t_i	$\bar{t}$	$\left(\frac{t_i - t}{s}\right)$	Tabel	D1	D2
1	187.5	37.5	-1.20	0.1151	0.11507	0.08493
2	301.5	60.3	-0.37	0.3557	0.155691	-0.15569
3	331.5833	66.31667	-0.16	0.4364	0.036441	-0.23644
4	337.5833	67.51667	-0.11	0.4562	-0.1438	-0.2562
5	607.5	121.5	1.84	0.9671	0.167116	-0.76712
Total	1765.667	353.1333				

Berikut ini contoh perhitungan *goodness of fit* distribusi normal pada komponen *Heater Catridge*:

$\bar{t} = \sum_{i=1}^{n} \frac{ti}{n} = \frac{45.9}{5} + \cdots + \frac{120.25}{5} = 353.1333$

$S^2 = \sum_{i=1}^{n} \frac{(t_1 - \bar{t})^2}{n} = 19101.8$

$S = 138.2093$

Dimana $\frac{t_i - \bar{t}}{s}$ diperoleh dari tabel standar normal dan lognormal.

$D_1 = \max_{1 \le i \le n} \left\{ \Phi \left(\frac{t_{i-t}}{s} \right) - \frac{1-i}{n} \right\} = 0.167116$

$D_2 = \max_{1 \le i \le n} \left\{ \frac{1}{n} - \Phi \left(\frac{t_{i-t}}{s} \right) \right\} = 0.08493$

Jadi nilai *Kolmogorov-smirnov* adalah 0.167116 dimana $D_n = \max\{D_1; D_2\}$. Sedangkan Dtabel ($D_{0.05; 5}$) = 0.563. Maka berdasarkan perhitungan diatas $D_{hitung} < D_{tabel}$ = 0.167116 < 0.563, maka kesimpulannya adalah H_0 diterima yang artinya bahwa data kerusakan komponen *Thermo Couple* berdistribusi lognormal.

4. Perhitungan Goodness of Fit Komponen *Disc Heater*

H_0 = Komponen *Disc Heater* berdistribusi weibull

H_1 = Komponen *Disc Heater* tidak berdistribusi weibull

i	t_i	ln t_i	Z_i	M_i	ln t_{i+1} – ln t_i	(ln t_{i+1} – ln t_i)/ M
1	255	5.541264	-5.17048	1.104332	0.3531393	0.3197763
2	363	5.894403	-4.06615	0.516601	0.4245653	0.8218443
3	555	6.318968	-3.54955	0.342304	0.0829491	0.2423261
4	603	6.401917	-3.20724	3.207245		

$$k1 = \frac{4}{2} = 2; \qquad k2 = \frac{4-1}{2} = 1.5 \sim 2$$

$$Z_i = \ln[-\ln(1 - \frac{i+0.5}{n+0.25})] = -5{,}17048$$

$$M_i = Z_{i+1} - Z_i$$

$$M_1 = -4{,}06 \ldots - (-5.17 \ldots) = 1{,}104$$

Uji statistiknya adalah sebagai berikut:

$$M = \frac{k1 \sum_{i=k1+1}^{r-1} \left[\frac{lnt_{i+1} - t_i}{M_i}\right]}{k2 \sum_{i=1}^{k1} \left[\frac{lnt_{i+1} - t_i}{M_i}\right]} = \frac{2 \sum_{3}^{3} [0.2423]}{2 \sum_{i=1}^{2} [0.3197 + 0.8218]} = 0{,}212265$$

Maka nilai *Mann* yaitu sebesar 0,212265. Sedangkan $F_{(0,05;6;8)}$ = 6,388. H_0 diterima apabila nilai M < F tabel. Sehingga pada perhitungan ini H_0 diterima.

5. Perhitungan Goodness of Fit Komponen *Spring*

H_0 = Data kerusakan komponen *Spring* berdistribusi lognormal

H_1 = Data kerusakan komponen *Spring* tidak berdistribusi lognormal

i	t_i	$\bar{t}$	$\left(\frac{t_i - t}{s}\right)$	Tabel	D1	D2
1	445.33	148.4444	-1.14	0.1271	0.127143	0.20619
2	493.17	164.3889	-0.16	0.4364	0.103107	-0.10311
3	564.83	188.2778	1.30	0.9032	0.236533	-0.56987
Total	1503.333	501.1111				

Berikut ini contoh perhitungan *goodness of fit* distribusi normal pada komponen *Heater Catridge*:

$$\bar{t} = \sum_{i=1}^{n} \frac{ti}{n} = \frac{445{,}33}{3} + \cdots + \frac{564{,}83}{3} = 501{,}1111$$

$S^2 = \sum_{i=1}^{n} \frac{(t_1 - \bar{t})^2}{n}$ = 2411,599

S = 49,10803

Dimana $\frac{t_i - \bar{t}}{s}$ diperoleh dari tabel standar normal dan lognormal.

$D_1 = \max_{1 \le i \le n} \left\{ \Phi \left(\frac{t_i - t}{s} \right) - \frac{1-i}{n} \right\}$ = 0.236533

$D_2 = \max_{1 \le i \le n} \left\{ \frac{1}{n} - \Phi \left(\frac{t_i - t}{s} \right) \right\}$ = 0,20619

Jadi nilai *Kolmogorov-smirnov* adalah 0.236533 dimana $D_n = \max\{D_1; D_2\}$. Sedangkan Dtabel ($D_{0.05; 5}$) = 0.708. Maka berdasarkan perhitungan diatas $D_{hitung} < D_{tabel}$ = 0.236533 < 0.7008, maka kesimpulannya adalah H_0 diterima yang artinya bahwa data kerusakan komponen *Spring* berdistribusi lognormal.

LAMPIRAN 8

Perhitungan Parameter Distribusi Komponen

1. Perhitungan Parameter Distrbusi Komponen *Cutter*

i	ti	R(ti)	Xi	Xi^2	Yi	Xi.Yi
1	121.33	0.875	4.799	23.0260	-2.01	-9.6615
2	199.25	0.75	5.295	28.0324	-1.25	-6.5965
3	216.67	0.625	5.378	28.9268	-0.76	-4.0607
4	318.75	0.5	5.764	33.2284	-0.37	-2.1127
5	336.67	0.375	5.819	33.8618	-0.02	-0.1126
6	414.67	0.25	6.027	36.3305	0.33	1.9688
7	468.58	0.125	6.150	37.8190	0.73	4.5022
Total			39.232	221.225	-3.34	-16.073

$$\beta = \frac{n\sum X_i Y_i - \sum X_i \sum Y_i}{\sum (X_i)^2 - (\sum X_i)^2} = \frac{7(-16{,}073) - \{(39{,}23)(-3{,}34)\}}{221{,}225 - (39{,}23)^2} = 1{,}97$$

$$c = \frac{n\sum X_i^2 \sum Y_i - \sum X_i \sum Y_i}{n\sum X_i^2 - (\sum X_i)^2} = \frac{7(221{,}225)(-3{,}34) - (39{,}23)(-3{,}34)}{7(221{,}22) - (39{,}23)^2} = -11{,}54$$

$$a = \theta = exp\left(-\frac{c}{\beta}\right) = 2{,}718^{\left(\frac{11{,}54}{1{,}97}\right)} = 349{,}76$$

2. Perhitungan Parameter Distrbusi Komponen *Heater Catridge*

μ merupakan *(A(ti))* TTF komponen sebesar 378,15 jam dan σ^2 merupakan variansi data *(Var(ti))* TTF komponen sebesar 17573,415 jam.

$$A(t_i) = e^{\mu + \frac{\sigma^2}{2}}$$

$$378{,}15 = e^{\mu + \frac{\sigma^2}{2}}$$

$$\ln 378{,}15 = \mu + \frac{\sigma^2}{2}$$

$$\mu = 5{,}93 - \frac{\sigma^2}{2}$$

$$Var(t_i) = e^{2\mu + \sigma^2} \times (e^{\sigma^2} - 1)$$

$$17573{,}415 = e^{2(5{,}93 - \frac{\sigma^2}{2}) + \sigma^2} \times (e^{\sigma^2} - 1)$$

$$17573{,}415 = e^{11{,}86} \times (e^{\sigma^2} - 1)$$

$$17573{,}415 = 141318{,}33 \times (e^{\sigma^2} - 1)$$

$$0{,}1243 = (e^{\sigma^2} - 1)$$

$e^{\sigma^2} = 1{,}1243$

$\sigma^2 = \ln 1{,}1243 = 0{,}21$

$\mu = 5{,}93 - \frac{\sigma^2}{2} = 5{,}93 - \frac{0{,}21^2}{2} = 5{,}9$

$t_{med} = e^{\mu} = 2.718^{5.9} = 364{,}81$

3. Perhitungan Parameter Distrbusi Komponen *Thermo Couple*

μ merupakan ($A(t_i)$) TTF komponen sebesar 220,71 jam dan σ^2 merupakan variansi data ($Var(t_i)$) TTF komponen sebesar 19101,8 jam.

$A(t_i) = e^{\mu + \frac{\sigma^2}{2}}$

$220{,}71 = e^{\mu + \frac{\sigma^2}{2}}$

$\ln 220{,}71 = \mu + \frac{\sigma^2}{2}$

$\mu = 5{,}39 - \frac{\sigma^2}{2}$

$Var(t_i) = e^{2\mu + \sigma^2} \times (e^{\sigma^2} - 1)$

$19101{,}8 = e^{2(5{,}39 - \frac{\sigma^2}{2}) + \sigma^2} \times (e^{\sigma^2} - 1)$

$19101{,}8 = e^{10{,}78} \times (e^{\sigma^2} - 1)$

$19101{,}8 = 47996{,}447 \times (e^{\sigma^2} - 1)$

$0{,}3979 = (e^{\sigma^2} - 1)$

$e^{\sigma^2} = 1{,}3979$

$\sigma^2 = \ln 1{,}3979 = 0{,}33$

$\mu = 5{,}39 - \frac{\sigma^2}{2} = 5{,}39 - \frac{0{,}33^2}{2} = 5{,}33$

$t_{med} = e^{\mu} = 2.718^{5.33} = 206{,}32$

4. Perhitungan Parameter Distrbusi Komponen *Disc Heater*

i	t_i	R(ti)	Xi	Xi^2	Yi	Xi.Yi
1	255	0.875	5.541	30.706	-2.013	-11.157
2	363	0.75	5.894	34.744	-1.246	-7.344
3	555	0.625	6.319	39.929	-0.755	-4.771
4	603	0.5	6.402	40.985	-0.367	-2.346
Total			24.157	146.363	-4.381	-25.618

$$\beta = \frac{n\sum X_i Y_i - \sum X_i \sum Y_i}{\sum (X_i)^2 - (\sum X_i)^2} = \frac{4(-25{,}618) - \{(24{,}157)(-4{,}38)\}}{146{,}363 - (24{,}157)^2} = 1{,}75$$

$$c = \frac{n\sum X_i^2 \sum Y_i - \sum X_i \sum Y_i}{n\sum X_i^2 - (\sum X_i)^2} = \frac{4(146{,}363)(-4{,}381) - (24{,}157)(-4{,}381)}{4(146{,}363) - (24{,}157)^2} = -11{,}67$$

$$a = \theta = exp\left(-\frac{c}{\beta}\right) = 2{,}718^{\left(\frac{11{,}67}{1{,}75}\right)} = 783{,}133$$

5. Perhitungan Parameter Distrbusi Komponen *Spring*

μ merupakan (*A(tᵢ)*) TTF komponen sebesar 501,11 jam dan σ^2 merupakan variansi data *(Var(tᵢ))* TTF komponen sebesar 2411,60 jam.

$$A(t_i) = e^{\mu + \frac{\sigma^2}{2}}$$

$$501{,}11 = e^{\mu + \frac{\sigma^2}{2}}$$

$$\ln 501{,}11 = \mu + \frac{\sigma^2}{2}$$

$$\mu = 6{,}21 - \frac{\sigma^2}{2}$$

$$Var(t_i) = e^{2\mu + \sigma^2} \times (e^{\sigma^2} - 1)$$

$$2411{,}60 = e^{2(6{,}21 - \frac{\sigma^2}{2}) + \sigma^2} \times (e^{\sigma^2} - 1)$$

$$2411{,}60 = e^{12{,}42} \times (e^{\sigma^2} - 1)$$

$$2411{,}60 = 247387{,}75 \times (e^{\sigma^2} - 1)$$

$$0{,}0097 = (e^{\sigma^2} - 1)$$

$$e^{\sigma^2} = 1{,}0097$$

$$\sigma^2 = \ln 1{,}0097 = 0{,}0096$$

$$\mu = 6{,}21 - \frac{\sigma^2}{2} = 6{,}21 - \frac{0{,}0096^2}{2} = 6{,}2$$

$$t_{med} = e^{\mu} = 2.718^{6{,}2} = 492{,}43$$

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LAMPIRAN 9

Perhitungan MTTF dan Keandalan Komponen

1. Perhitungan MTTF dan Keandalan Komponen *Cutter*

   $MTTF = \theta\Gamma\left(1+\frac{1}{\beta}\right) = 349{,}76\ \Gamma\left(1+\frac{1}{1{,}97}\right) = 307{,}78$

   Sebelum penjadwalan:

   $R(t) = e^{-(t/\theta)^{\beta}} = 2{,}718^{-(468{,}58/349{,}76)^{1{,}97}} = 0{,}1827 = 18{,}27\%$

   Sesudah penjadawalan:

   $R(t) = e^{-(t/\theta)^{\beta}} = 2{,}718^{-(307{,}78/349{,}76)^{1{,}97}} = 0{,}4644 = 46{,}44\%$

2. Perhitungan MTTF dan Keandalan Komponen *Heater Catridge*

   $MTTF = e^{\mu+\frac{1}{2}(\sigma)^2}$

   $MTTF = 2.718^{5{,}9+\frac{1}{2}0.21} = 405{,}19$

   Sebelum penjadwalan:

   $R(t) = 1-\Phi\left(\frac{1}{\sigma}ln\frac{t}{t_{med}}\right)$

   $R(t) = 1-\Phi\left(\frac{1}{0{,}45}ln\frac{601{,}25}{364{,}81}\right)$

   $R(t) = 1-\Phi(1{,}11)$

   $R(t) = 1-0{,}8643 = 0{,}1357 = 13{,}57\%$

   Sesudah penjadwalan:

   $R(t) = 1-\Phi\left(\frac{1}{\sigma}ln\frac{t}{t_{med}}\right)$

   $R(t) = 1-\Phi\left(\frac{1}{0{,}45}ln\frac{405{,}19}{364{,}81}\right)$

   $R(t) = 1-\Phi(0{,}23)$

   $R(t) = 1-0{,}591 = 0{,}409 = 40{,}9\%$

3. Perhitungan MTTF dan Keandalan Komponen *Thermo Couple*

   $MTTF = e^{\mu+\frac{1}{2}(\sigma)^2}$

   $MTTF = 2.718^{5{,}33+\frac{1}{2}0.33} = 243{,}33$

   Sebelum penjadwalan:

   $R(t) = 1-\Phi\left(\frac{1}{\sigma}ln\frac{t}{t_{med}}\right)$

$$R(t) = 1 - \Phi\left(\frac{1}{0{,}57} ln \frac{607{,}5}{206{,}32}\right)$$

$$R(t) = 1 - \Phi(1{,}89)$$

$$R(t) = 1 - 0{,}9706 = 0{,}0294 = 2{,}94\%$$

Sesudah penjadwalan:

$$R(t) = 1 - \Phi\left(\frac{1}{\sigma} ln \frac{t}{t_{med}}\right)$$

$$R(t) = 1 - \Phi\left(\frac{1}{0{,}57} ln \frac{243{,}33}{206{,}32}\right)$$

$$R(t) = 1 - \Phi(0{,}28)$$

$$R(t) = 1 - 0{,}6103 = 0{,}3897 = 38{,}97\%$$

4. Perhitungan MTTF dan Keandalan Komponen *Disc Heater*

$$MTTF = \theta\Gamma\left(1 + \frac{1}{\beta}\right) = 783{,}133\ \Gamma\left(1 + \frac{1}{1{,}75}\right) = 696{,}98$$

Sebelum penjadwalan:

$R(t) = e^{-(t/\theta)^{\beta}} = 2{,}718^{-(696{,}98/783{,}133)^{1{,}75}}$ = 0,4644 = 46,44%

Sesudah penjadawalan:

$R(t) = e^{-(t/\theta)^{\beta}} = 2{,}718^{-(603/783{,}133)^{1{,}75}}$ = 0,5433 = 54,33%

5. Perhitungan MTTF dan Keandalan Komponen *Spring*

$$MTTF = e^{\mu + \frac{1}{2}(\sigma)^2}$$

$MTTF = 2.718^{6{,}2 + \frac{1}{2}0.0096}$ = 494,8

Sebelum penjadwalan:

$$R(t) = 1 - \Phi\left(\frac{1}{\sigma} ln \frac{t}{t_{med}}\right)$$

$$R(t) = 1 - \Phi\left(\frac{1}{0{,}09} ln \frac{564{,}83}{492{,}43}\right)$$

$$R(t) = 1 - \Phi(1{,}52)$$

$$R(t) = 1 - 0{,}9357 = 0{,}0643 = 6{,}43\%$$

Sesudah penjadwalan:

$$R(t) = 1 - \Phi\left(\frac{1}{\sigma} ln \frac{t}{t_{med}}\right)$$

$$R(t) = 1 - \Phi\left(\frac{1}{0{,}09} ln \frac{494{,}8}{492{,}43}\right)$$

$$R(t) = 1 - \Phi(0{,}05)$$

LAMPIRAN 10

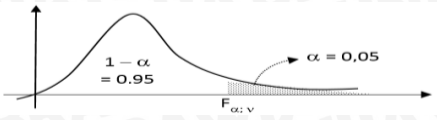
Tabel Normal Standar

b	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
-3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359

b	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
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	0.7088	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	0.8078	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	0.9772	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	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

LAMPIRAN 11

Tabel F



v_2 / v_1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	161.448	18.513	10.128	7.709	6.608	5.987	5.591	5.318	5.117	4.965	4.844	4.747	4.667	4.600	4.543	4.494	4.451	4.414	4.381	4.351	4.325	4.30
2	199.500	19.000	9.552	6.944	5.786	5.143	4.737	4.459	4.256	4.103	3.982	3.885	3.806	3.739	3.682	3.634	3.592	3.555	3.522	3.493	3.467	3.44
3	215.707	19.164	9.277	6.591	5.409	4.757	4.347	4.066	3.863	3.708	3.587	3.490	3.411	3.344	3.287	3.239	3.197	3.160	3.127	3.098	3.072	3.04
4	224.583	19.247	9.117	6.388	5.192	4.534	4.120	3.838	3.633	3.478	3.357	3.259	3.179	3.112	3.056	3.007	2.965	2.928	2.895	2.866	2.840	2.81
5	230.162	19.296	9.013	6.256	5.050	4.387	3.972	3.687	3.482	3.326	3.204	3.106	3.025	2.958	2.901	2.852	2.810	2.773	2.740	2.711	2.685	2.66
6	233.986	19.330	8.941	6.163	4.950	4.284	3.866	3.581	3.374	3.217	3.095	2.996	2.915	2.848	2.790	2.741	2.699	2.661	2.628	2.599	2.573	2.54
7	236.768	19.353	8.887	6.094	4.876	4.207	3.787	3.500	3.293	3.135	3.012	2.913	2.832	2.764	2.707	2.657	2.614	2.577	2.544	2.514	2.488	2.46
8	238.883	19.371	8.845	6.041	4.818	4.147	3.726	3.438	3.230	3.072	2.948	2.849	2.767	2.699	2.641	2.591	2.548	2.510	2.477	2.447	2.420	2.39
9	240.543	19.385	8.812	5.999	4.772	4.099	3.677	3.388	3.179	3.020	2.896	2.796	2.714	2.646	2.588	2.538	2.494	2.456	2.423	2.393	2.366	2.34
10	241.882	19.396	8.786	5.964	4.735	4.060	3.637	3.347	3.137	2.978	2.854	2.753	2.671	2.602	2.544	2.494	2.450	2.412	2.378	2.348	2.321	2.29
11	242.983	19.405	8.763	5.936	4.704	4.027	3.603	3.313	3.102	2.943	2.818	2.717	2.635	2.565	2.507	2.456	2.413	2.374	2.340	2.310	2.283	2.25
12	243.906	19.413	8.745	5.912	4.678	4.000	3.575	3.284	3.073	2.913	2.788	2.687	2.604	2.534	2.475	2.425	2.381	2.342	2.308	2.278	2.250	2.22
13	244.690	19.419	8.729	5.891	4.655	3.976	3.550	3.259	3.048	2.887	2.761	2.660	2.577	2.507	2.448	2.397	2.353	2.314	2.280	2.250	2.222	2.19
14	245.364	19.424	8.715	5.873	4.636	3.956	3.529	3.237	3.025	2.865	2.739	2.637	2.554	2.484	2.424	2.373	2.329	2.290	2.256	2.225	2.197	2.17
15	245.950	19.429	8.703	5.858	4.619	3.938	3.511	3.218	3.006	2.845	2.719	2.617	2.533	2.463	2.403	2.352	2.308	2.269	2.234	2.203	2.176	2.15
16	246.464	19.433	8.692	5.844	4.604	3.922	3.494	3.202	2.989	2.828	2.701	2.599	2.515	2.445	2.385	2.333	2.289	2.250	2.215	2.184	2.156	2.13
17	246.918	19.437	8.683	5.832	4.590	3.908	3.480	3.187	2.974	2.812	2.685	2.583	2.499	2.428	2.368	2.317	2.272	2.233	2.198	2.167	2.139	2.11
18	247.323	19.440	8.675	5.821	4.579	3.896	3.467	3.173	2.960	2.798	2.671	2.568	2.484	2.413	2.353	2.302	2.257	2.217	2.182	2.151	2.123	2.09
19	247.686	19.443	8.667	5.811	4.568	3.884	3.455	3.161	2.948	2.785	2.658	2.555	2.471	2.400	2.340	2.288	2.243	2.203	2.168	2.137	2.109	2.08
20	248.013	19.446	8.660	5.803	4.558	3.874	3.445	3.150	2.936	2.774	2.646	2.544	2.459	2.388	2.328	2.276	2.230	2.191	2.155	2.124	2.096	2.07
21	248.309	19.448	8.654	5.795	4.549	3.865	3.435	3.140	2.926	2.764	2.636	2.533	2.448	2.377	2.316	2.264	2.219	2.179	2.144	2.112	2.084	2.05
22	248.579	19.450	8.648	5.787	4.541	3.856	3.426	3.131	2.917	2.754	2.626	2.523	2.438	2.367	2.306	2.254	2.208	2.168	2.133	2.102	2.073	2.04

Halaman ini sengaja dikosongkan

LAMPIRAN 12

Tabel Kolmogorov – Smirnorv

n	α = 0,20	α = 0,10	α = 0,05	α = 0,02	α = 0,01
1	0,900	0,950	0,975	0,990	0,995
2	0,684	0,776	0,842	0,900	0,929
3	0,565	0,636	0,708	0,785	0,829
4	0,493	0,565	0,624	0,689	0,734
5	0,447	0,509	0,563	0,627	0,669
6	0,410	0,468	0,519	0,577	0,617
7	0,381	0,436	0,483	0,538	0,576
8	0,359	0,410	0,454	0,507	0,542
9	0,339	0,387	0,430	0,480	0,513
10	0,323	0,369	0,409	0,457	0,486
11	0,308	0,352	0,391	0,437	0,468
12	0,296	0,338	0,375	0,419	0,449
13	0,285	0,325	0,361	0,404	0,432
14	0,275	0,314	0,349	0,390	0,418
15	0,266	0,304	0,338	0,377	0,404
16	0,258	0,295	0,327	0,366	0,392
17	0,250	0,286	0,318	0,355	0,381
18	0,244	0,279	0,309	0,346	0,371
19	0,237	0,271	0,301	0,337	0,361
20	0,232	0,265	0,294	0,329	0,352
21	0,226	0,259	0,287	0,321	0,344
22	0,221	0,253	0,281	0,314	0,337
23	0,216	0,247	0,275	0,307	0,330
24	0,212	0,242	0,269	0,301	0,323
25	0,208	0,238	0,264	0,295	0,317
26	0,204	0,233	0,259	0,290	0,311
27	0,200	0,229	0,254	0,284	0,305
28	0,197	0,225	0,250	0,279	0,300
29	0,193	0,221	0,246	0,275	0,295
30	0,190	0,218	0,242	0,270	0,290
35	0,177	0,202	0,224	0,251	0,269
40	0,165	0,189	0,210	0,235	0,252
45	0,156	0,179	0,198	0,222	0,238
50	0,148	0,170	0,188	0,211	0,226
55	0,142	0,162	0,180	0,201	0,216
60	0,136	0,155	0,172	0,193	0,207
65	0,131	0,149	0,166	0,185	0,199
70	0,126	0,144	0,160	0,179	0,192
75	0,122	0,139	0,154	0,173	0,185
80	0,118	0,135	0,150	0,167	0,179
85	0,114	0,131	0,145	0,162	0,174
90	0,111	0,127	0,141	0,158	0,169
95	0,108	0,124	0,137	0,154	0,165
100	0,106	0,121	0,134	0,150	0,161