

Lampiran 1
List Machine for Smart Card Production PT.CIPTA

No	Name of Machine	Type of Machine	Origin	Quantity	Output Per Hour	Unit	Machine Picture
1	Prepress	KODAK Magnus 400 Quantum - II	Kodak, Japan	1	15 Plates/Jam	Plates	
2	Offset Printing	HEIDELBERG SM52	Germany	2	10,000 Sheets PVC/Jam	Sheets PVC	
3	Sheet Collating	BURKLE Weld Table WT100	Burkle, Germany	10	500 Sets PVC/Jam	Sets PVC	
4	Sheet Laminating	BURKLE CHK 100/200	Burkle, Germany	3	10,000 Sets PVC/Jam	Sets PVC	
5	Punching (Card Size Punching)	MUHLBAUER CP2007	Muehlbauer, Germany	2	12,000 Kartu/Jam	Cards	
6	Card Inspection	MUHLBAUER PI36010	Muehlbauer, Germany	1	10,000 Kartu/Jam	Cards	
7	Laminating Chip (Glue Taping)	MUHLBAUER CML200	Muehlbauer, Germany	3	7,000 Chip Module/Jam	Modul	
8	Card Milling Implanting	MUHLBAUER CMI200+	Muehlbauer, Germany	8	7,000 Kartu/Jam	Cards	
9	GSM Punching	MUHLBAUER CMP200	Muehlbauer, Germany	8	12,000 Kartu/Jam	Cards	
		MUHLBAUER CMP2010	Muehlbauer, Germany	1	10,000 Kartu/Jam	Cards	
10	Personalization	MUHLBAUER GSM5000	Muehlbauer, Germany	3	6,000 Kartu/Jam	Cards	
		MUHLBAUER GSM6000	Muehlbauer, Germany	2	4,000 Kartu/Jam	Cards	
11	QC Tools	<ul style="list-style-type: none"> - Bending Torsion - Dynamic Torsion - Peel Strength - Push Test Chip - Thickness Gauge - Card Reader - Barcode Reader - Caliper - Card Counter - Plug in and Mill Position 					

Lampiran 3
Tabel Distribusi Normal Standar (Tabel Z)

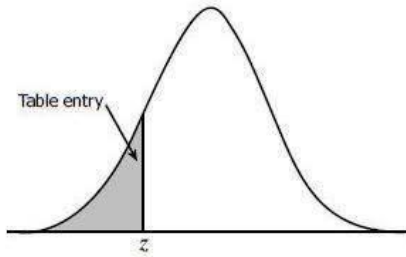


Table entry for z is the area under the standard normal curve to the left of z .

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

Sumber: Wallpole (1982)

Lampiran 3
Lanjutan Tabel Distribusi Normal Standar (Tabel Z)

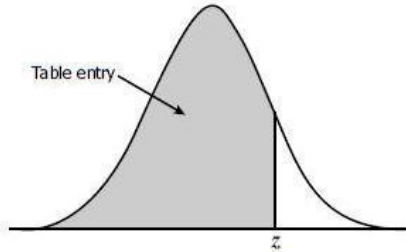


Table entry for z is the area under the standard normal curve to the left of z .

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Sumber: Wallpole (1982)

Lampiran 4
Tabel Fungsi Gamma

$$\Gamma(n) = \int_0^{\infty} e^{-x} x^{n-1} dx, \quad 1 \leq n \leq 2.$$

<i>n</i>	$\Gamma(n)$	<i>n</i>	$\Gamma(n)$	<i>n</i>	$\Gamma(n)$	<i>n</i>	$\Gamma(n)$
1.00	1.00000	1.25	0.90640	1.50	0.88623	1.75	0.91906
1.01	0.99433	1.26	0.90440	1.51	0.88659	1.76	0.92137
1.02	0.98884	1.27	0.90250	1.52	0.88704	1.77	0.92376
1.03	0.98355	1.28	0.90072	1.53	0.88757	1.78	0.92623
1.04	0.97844	1.29	0.89904	1.54	0.88818	1.79	0.92877
1.05	0.97350	1.30	0.89747	1.55	0.88887	1.80	0.93138
1.06	0.96874	1.31	0.89600	1.56	0.88964	1.81	0.93408
1.07	0.96415	1.32	0.89464	1.57	0.89049	1.82	0.93685
1.08	0.95973	1.33	0.89338	1.58	0.89142	1.83	0.93969
1.09	0.95546	1.34	0.89222	1.59	0.89243	1.84	0.94261
1.10	0.95135	1.35	0.89115	1.60	0.89352	1.85	0.94561
1.11	0.94739	1.36	0.89018	1.61	0.89468	1.86	0.94869
1.12	0.94359	1.37	0.88931	1.62	0.89592	1.87	0.95184
1.13	0.93993	1.38	0.88854	1.63	0.89724	1.88	0.95507
1.14	0.93642	1.39	0.88785	1.64	0.89864	1.89	0.95838
1.15	0.93304	1.40	0.88726	1.65	0.90012	1.90	0.96177
1.16	0.92980	1.41	0.88676	1.66	0.90167	1.91	0.96523
1.17	0.92670	1.42	0.88636	1.67	0.90330	1.92	0.96878
1.18	0.92373	1.43	0.88604	1.68	0.90500	1.93	0.97240
1.19	0.92088	1.44	0.88580	1.69	0.90678	1.94	0.97610
1.20	0.91817	1.45	0.88565	1.70	0.90864	1.95	0.97988
1.21	0.91558	1.46	0.88560	1.71	0.91057	1.96	0.98374
1.22	0.91311	1.47	0.88563	1.72	0.91258	1.97	0.98768
1.23	0.91075	1.48	0.88575	1.73	0.91466	1.98	0.99171
1.24	0.90852	1.49	0.88595	1.74	0.91683	1.99	0.99581
						2.00	1.00000

Sumber: Kailash (2014)

Lampiran 5
Data Interval Kerusakan dan Waktu Perbaikan Komponen CID

CID (CARD INPUT DEVICE)				
Date	Interval Kerusakan (Jam)	Start Time	End Time	Total Downtime (Menit)
16 Januari 2015				
24 Maret 2015	758	7:00	7:30	30
28 Mei 2015	766	13:00	13:45	45
30 Juli 2015	724	10:00	10:30	30
28 September 2015	676	14:00	14:30	30
27 Nopember 2015	715	17:00	17:15	15
26 Januari 2016	674	11:00	0:00	60
28 Maret 2016	713	13:00	13:30	30
01 Juni 2016	765	22:00	22:30	30
03 Agustus 2016	723	18:00	18:20	20
07 Oktober 2016	764	21:00	22:00	60
13 Desember 2016	776	21:00	21:45	45
17 Februari 2017	769	7:00	7:20	20
20 April 2017	713	8:00	8:20	20
22 Juni 2017	734	17:00	17:30	30
31 Agustus 2017	789	14:00	14:40	40
09 Nopember 2017	754	19:00	20:00	60
10 Januari 2018	656	21:00	21:30	30
19 Maret 2018	696	21:00	21:30	30
30 Mei 2018	728	12:00	12:45	45
15 Agustus 2018	764	20:00	20:15	15
30 Oktober 2019	696	16:00	16:30	30
18 Januari 2019	770	7:00	8:00	60
26 Maret 2019	724	9:00	9:30	30
10 Juni 2019	712	13:00	13:15	15

Lampiran 5
Data Interval Kerusakan dan Waktu Perbaikan Komponen *Milling*

MILLING				
Date	Interval Kerusakan (Jam)	Start Time	End Time	Total Downtime (Menit)
15 Februari 2016				
28 Maret 2016	486	15:00	15:20	20
06 Mei 2016	546	20:00	20:30	30
27 Juni 2016	576	11:00	11:30	30
16 Agustus 2016	576	11:00	11:30	30
05 Oktober 2016	565	11:00	11:45	45
22 Nopember 2016	545	16:00	16:20	20
06 Januari 2017	532	8:00	8:30	30
21 Februari 2017	527	12:00	12:30	30
03 April 2017	465	10:00	10:15	15
15 Juni 2017	486	11:00	11:30	30
27 Juli 2017	490	18:00	18:30	30
11 September 2017	487	11:00	11:20	20
24 Oktober 2017	478	18:00	18:20	20
06 Desember 2017	486	13:00	13:20	20
21 Februari 2018	486	19:00	19:30	30
12 April 2018	554	8:00	8:20	20
06 Juni 2018	534	8:00	8:45	45
30 Juli 2018	465	14:00	14:20	20
14 September 2018	498	15:00	16:00	60
23 Nopember 2018	580	17:00	17:30	30
18 Januari 2019	576	21:00	21:30	30
04 Maret 2019	565	21:00	21:30	30
25 April 2019	554	9:00	9:30	30
14 Juni 2019	465	9:00	9:45	45

Lampiran 5
Data Interval Kerusakan dan Waktu Perbaikan Komponen *Cleaning*

CLEANING				
Date	Interval Kerusakan (Jam)	Start Time	End Time	Total Downtime (Menit)
24 April 2014				
03 Juli 2014	809	12:00	13:00	60
18 September 2014	886	21:00	21:40	40
01 Desember 2014	846	10:00	10:40	40
11 Februari 2015	845	7:00	7:30	30
27 April 2015	857	20:00	20:30	30
03 Juli 2015	876	12:00	12:30	30
14 September 2015	830	7:00	8:00	60
01 Desember 2015	909	20:00	21:30	90
15 Februari 2016	865	16:00	17:00	60
28 April 2016	853	17:00	18:30	90
11 Juli 2016	847	22:00	22:30	30
23 September 2016	865	20:00	20:30	30
09 Desember 2016	889	21:00	21:40	40
24 Februari 2017	887	13:00	13:45	45
10 Mei 2017	853	20:00	21:00	60
25 Juli 2017	876	9:00	9:30	30
17 Oktober 2017	913	21:00	21:30	30
03 Januari 2018	842	22:00	23:30	90
21 Maret 2018	864	16:00	17:00	60
02 Juli 2018	904	16:00	16:45	45
19 September 2018	878	7:00	8:30	90
21 Desember 2019	854	21:00	22:00	60
14 Maret 2019	853	10:00	10:40	40
12 Juni 2019	865	15:00	15:30	30

Lampiran 5

Data Interval Kerusakan dan Waktu Perbaikan Komponen *Module Punch*

MODULE PUNCH				
Date	Interval Kerusakan (Jam)	Start Time	End Time	Total Downtime (Menit)
15 Oktober 2014				
23 Desember 2014	786	22:00	23:00	60
26 Februari 2015	746	7:00	8:00	60
05 Mei 2015	776	17:00	18:30	90
10 Juli 2015	776	8:00	9:15	75
15 September 2015	765	16:00	17:00	60
18 Nopember 2015	745	12:00	14:00	120
20 Januari 2016	731	21:00	22:30	90
23 Maret 2016	727	15:00	16:30	90
27 Mei 2016	765	22:00	23:00	60
04 Agustus 2016	786	19:00	20:20	80
12 Oktober 2016	790	21:00	22:30	90
21 Desember 2016	807	13:00	14:30	90
02 Maret 2017	808	20:00	22:00	120
10 Mei 2017	806	11:00	13:00	120
18 Juli 2017	786	17:00	18:30	90
26 September 2017	754	19:00	20:00	60
06 Desember 2017	804	21:00	22:00	60
13 Februari 2018	765	7:00	9:00	120
26 April 2018	798	11:00	13:00	75
24 Juli 2018	780	8:00	10:00	120
08 Oktober 2018	776	20:00	21:30	90
02 Januari 2019	765	11:00	12:00	60
12 Maret 2019	754	7:00	8:20	80
22 Mei 2019	765	9:00	10:30	90

Lampiran 5
Data Interval Kerusakan dan Waktu Perbaikan Komponen *Tacking*

TACKING				
Date	Interval Kerusakan (Jam)	Start Time	End Time	Total Downtime (Menit)
19 Januari 2017				
21 Februari 2017	367	19:00	19:15	15
21 Maret 2017	323	22:00	22:20	20
27 April 2017	435	8:00	8:20	20
31 Mei 2017	397	21:00	21:15	15
05 Juli 2017	405	9:00	9:30	30
08 Agustus 2017	397	22:00	22:30	30
15 September 2017	421	11:00	12:45	45
24 Oktober 2017	403	14:00	15:00	60
30 Nopember 2017	433	15:00	16:00	60
03 Januari 2018	343	20:00	20:45	45
01 Februari 2018	342	9:00	9:20	20
07 Maret 2018	376	17:00	17:30	30
11 April 2018	379	11:00	11:30	30
16 Mei 2018	356	15:00	15:15	15
10 Juli 2018	436	19:00	19:30	30
13 Agustus 2018	397	15:00	15:30	30
17 September 2018	365	11:00	12:00	60
31 Oktober 2018	387	14:00	14:45	45
13 Desember 2018	411	8:00	8:30	30
23 Januari 2018	401	9:00	9:35	35
27 Februari 2019	395	21:00	22:00	60
01 April 2019	365	17:00	18:00	60
10 Mei 2019	413	13:00	13:30	30
20 Juni 2017	367	11:00	11:30	30

Lampiran 5
Data Interval Kerusakan dan Waktu Perbaikan Komponen *Welding*

WELDING				
Date	Interval Kerusakan (Jam)	Start Time	End Time	Total Downtime (Menit)
28 Desember 2015				
16 Februari 2016	568	18:00	19:30	90
05 April 2017	574	19:00	19:30	30
24 Mei 2016	565	11:00	11:30	30
13 Juli 2016	576	12:00	13:30	90
02 September 2016	606	12:00	13:00	60
24 Oktober 2016	576	9:00	9:45	45
09 Desember 2016	557	9:00	9:40	40
25 Januari 2017	543	12:00	13:00	60
20 Maret 2017	622	10:00	11:00	60
08 Mei 2017	567	21:00	22:30	90
23 Juni 2017	545	13:00	13:45	45
14 Agustus 2017	576	22:00	22:50	50
06 Oktober 2017	576	22:00	23:00	60
28 Nopember 2017	582	22:00	23:00	60
22 Januari 2018	587	11:00	12:30	90
13 Maret 2018	565	22:00	22:30	30
08 Mei 2018	607	21:00	21:30	30
18 Juli 2018	599	11:00	12:00	60
13 September 2018	616	19:00	20:30	90
15 Nopember 2018	587	13:00	14:00	60
27 Desember 2018	575	17:00	18:00	60
19 Februari 2019	567	7:00	7:30	30
12 April 2019	579	10:00	11:30	90
12 Juni 2019	546	18:00	18:30	30

Lampiran 6
Uji Distribusi Waktu Kerusakan Komponen CID (*Card Input Device*)

A. Distribusi Normal

i	Ti	F(Ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	656	0.0287	-1.90	430336	3.61	-1246.40	-75.63	5719.14
2	674	0.0697	-1.48	454276	2.19	-997.52	-57.63	3320.64
3	676	0.1107	-1.22	456976	1.49	-824.72	-55.63	3094.14
4	696	0.1516	-1.03	484416	1.06	-716.88	-35.63	1269.14
5	696	0.1926	-0.87	484416	0.76	-605.52	-35.63	1269.14
6	712	0.2336	-0.73	506944	0.53	-519.76	-19.63	385.14
7	713	0.2746	-0.60	508369	0.36	-427.80	-18.63	346.89
8	713	0.3156	-0.48	508369	0.23	-342.24	-18.63	346.89
9	715	0.3566	-0.36	511225	0.13	-257.40	-16.63	276.39
10	723	0.3975	-0.26	522729	0.07	-187.98	-8.63	74.39
11	724	0.4385	-0.16	524176	0.03	-115.84	-7.63	58.14
12	724	0.4795	-0.05	524176	0.00	-36.20	-7.63	58.14
13	728	0.5205	0.05	529984	0.00	36.40	-3.63	13.14
14	734	0.5615	0.16	538756	0.03	117.44	2.38	5.64
15	754	0.6025	0.26	568516	0.07	196.04	22.38	500.64
16	758	0.6434	0.36	574564	0.13	272.88	26.38	695.64
17	764	0.6844	0.48	583696	0.23	366.72	32.38	1048.14
18	764	0.7254	0.60	583696	0.36	458.40	32.38	1048.14
19	765	0.7664	0.73	585225	0.53	558.45	33.38	1113.89
20	766	0.8074	0.87	586756	0.76	666.42	34.38	1181.64
21	769	0.8484	1.03	591361	1.06	792.07	37.38	1396.89
22	770	0.8893	1.22	592900	1.49	939.40	38.38	1472.64
23	776	0.9303	1.48	602176	2.19	1148.48	44.38	1969.14
24	789	0.9713	1.90	622521	3.61	1499.10	57.38	3291.89
Total	17559	12	0	12876559	20.91	773.54	0	29955.625
Mean	731.63	0.50	0	536523.29	0.87	32.23	0	1248.15

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(773.54) - (17559)(0) = 18564.96 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(12876559) - (17559)^2 = 718935 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{18564.96}{\sqrt{718935 \times 501.8496}} = 0.9774$$

B. Distribusi Lognormal

i	ti	F(ti)	Ti = LN(ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	656	0.0287	6.4862	-1.90	42.07	3.61	-12.32	-0.1079	0.0116
2	674	0.0697	6.5132	-1.48	42.42	2.19	-9.64	-0.0809	0.0065
3	676	0.1107	6.5162	-1.22	42.46	1.49	-7.95	-0.0779	0.0061
4	696	0.1516	6.5453	-1.03	42.84	1.06	-6.74	-0.0487	0.0024
5	696	0.1926	6.5453	-0.87	42.84	0.76	-5.69	-0.0487	0.0024
6	712	0.2336	6.5681	-0.73	43.14	0.53	-4.79	-0.0260	0.0007
7	713	0.2746	6.5695	-0.60	43.16	0.36	-3.94	-0.0246	0.0006
8	713	0.3156	6.5695	-0.48	43.16	0.23	-3.15	-0.0246	0.0006
9	715	0.3566	6.5723	-0.36	43.19	0.13	-2.37	-0.0218	0.0005
10	723	0.3975	6.5834	-0.26	43.34	0.07	-1.71	-0.0107	0.0001
11	724	0.4385	6.5848	-0.16	43.36	0.03	-1.05	-0.0093	0.0001
12	724	0.4795	6.5848	-0.05	43.36	0.00	-0.33	-0.0093	0.0001
13	728	0.5205	6.5903	0.05	43.43	0.00	0.33	-0.0038	0.0000
14	734	0.5615	6.5985	0.16	43.54	0.03	1.06	0.0044	0.0000
15	754	0.6025	6.6254	0.26	43.90	0.07	1.72	0.0313	0.0010
16	758	0.6434	6.6307	0.36	43.97	0.13	2.39	0.0366	0.0013
17	764	0.6844	6.6386	0.48	44.07	0.23	3.19	0.0445	0.0020
18	764	0.7254	6.6386	0.60	44.07	0.36	3.98	0.0445	0.0020
19	765	0.7664	6.6399	0.73	44.09	0.53	4.85	0.0458	0.0021
20	766	0.8074	6.6412	0.87	44.11	0.76	5.78	0.0471	0.0022
21	769	0.8484	6.6451	1.03	44.16	1.06	6.84	0.0510	0.0026
22	770	0.8893	6.6464	1.22	44.17	1.49	8.11	0.0523	0.0027
23	776	0.9303	6.6542	1.48	44.28	2.19	9.85	0.0601	0.0036
24	789	0.9713	6.6708	1.90	44.50	3.61	12.67	0.0767	0.0059
Total	17559	12	158.2581	0	1043.6246	20.91	1.07	0	0.0571
Mean	731.63	0.50	6.5941	0	43.48	0.87	0.04	0	0.0024

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(1.07) - (158.2581)(0) = 25.5768 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(1043.6246) - (158.2581)^2 = 1.37048 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{25.5768}{\sqrt{1.37048 \times 501.8496}} = 0.9753$$

C. Distribusi Eksponensial

i	Ti	F(Ti)	Yi = LN [1-F(Ti)]	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	656	0.0287	-0.0291	430336	0.0008	-19.0949	-75.63	5719.14
2	674	0.0697	-0.0722	454276	0.0052	-48.6751	-57.63	3320.64
3	676	0.1107	-0.1173	456976	0.0138	-79.2751	-55.63	3094.14
4	696	0.1516	-0.1644	484416	0.0270	-114.4568	-35.63	1269.14
5	696	0.1926	-0.2140	484416	0.0458	-148.9193	-35.63	1269.14
6	712	0.2336	-0.2661	506944	0.0708	-189.4344	-19.63	385.14
7	713	0.2746	-0.3210	508369	0.1031	-228.8862	-18.63	346.89
8	713	0.3156	-0.3792	508369	0.1438	-270.3514	-18.63	346.89
9	715	0.3566	-0.4409	511225	0.1944	-315.2595	-16.63	276.39
10	723	0.3975	-0.5067	522729	0.2568	-366.3699	-8.63	74.39
11	724	0.4385	-0.5772	524176	0.3331	-417.8836	-7.63	58.14
12	724	0.4795	-0.6530	524176	0.4264	-472.7583	-7.63	58.14
13	728	0.5205	-0.7350	529984	0.5402	-535.0758	-3.63	13.14
14	734	0.5615	-0.8243	538756	0.6795	-605.0651	2.38	5.64
15	754	0.6025	-0.9225	568516	0.8509	-695.5328	22.38	500.64
16	758	0.6434	-1.0313	574564	1.0635	-781.6952	26.38	695.64
17	764	0.6844	-1.1534	583696	1.3302	-881.1692	32.38	1048.14
18	764	0.7254	-1.2925	583696	1.6705	-987.4514	32.38	1048.14
19	765	0.7664	-1.4541	585225	2.1145	-1112.3995	33.38	1113.89
20	766	0.8074	-1.6470	586756	2.7127	-1261.6178	34.38	1181.64
21	769	0.8484	-1.8863	591361	3.5579	-1450.5265	37.38	1396.89
22	770	0.8893	-2.2013	592900	4.8459	-1695.0251	38.38	1472.64
23	776	0.9303	-2.6640	602176	7.0967	-2067.2290	44.38	1969.14
24	789	0.9713	-3.5513	622521	12.6114	-2801.9426	57.38	3291.89
Total	17559	12	-23.1039	12876559	40.6949	-17546.09	0	29955.63
Mean	731.63	0.50	-0.9627	536523.29	1.6956	-731.09	0	1248.15

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(-17546.09) - (17559)(-23.1039) = -15424.7$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(12876559) - (17559)^2 = 718935$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(40.6949) - (-23.1039)^2 = 442.8872$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{15424.7}{\sqrt{718935 \times 442.8872}} = -0.8644$$

D. Distribusi Weibull

i	Ti	F(ti)	Ti = LN (ti)	Yi = LN{-LN [1-F(Ti)]}	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	656	0.0287	6.4862	-3.5367	42.07	12.51	-22.94	-0.11	0.0116
2	674	0.0697	6.5132	-2.6281	42.42	6.91	-17.12	-0.08	0.0065
3	676	0.1107	6.5162	-2.1433	42.46	4.59	-13.97	-0.08	0.0061
4	696	0.1516	6.5453	-1.8052	42.84	3.26	-11.82	-0.05	0.0024
5	696	0.1926	6.5453	-1.5419	42.84	2.38	-10.09	-0.05	0.0024
6	712	0.2336	6.5681	-1.3240	43.14	1.75	-8.70	-0.03	0.0007
7	713	0.2746	6.5695	-1.1363	43.16	1.29	-7.46	-0.02	0.0006
8	713	0.3156	6.5695	-0.9698	43.16	0.94	-6.37	-0.02	0.0006
9	715	0.3566	6.5723	-0.8189	43.19	0.67	-5.38	-0.02	0.0005
10	723	0.3975	6.5834	-0.6798	43.34	0.46	-4.48	-0.01	0.0001
11	724	0.4385	6.5848	-0.5496	43.36	0.30	-3.62	-0.01	0.0001
12	724	0.4795	6.5848	-0.4262	43.36	0.18	-2.81	-0.01	0.0001
13	728	0.5205	6.5903	-0.3079	43.43	0.09	-2.03	0.00	0.0000
14	734	0.5615	6.5985	-0.1932	43.54	0.04	-1.27	0.00	0.0000
15	754	0.6025	6.6254	-0.0807	43.90	0.01	-0.53	0.03	0.0010
16	758	0.6434	6.6307	0.0308	43.97	0.00	0.20	0.04	0.0013
17	764	0.6844	6.6386	0.1427	44.07	0.02	0.95	0.04	0.0020
18	764	0.7254	6.6386	0.2566	44.07	0.07	1.70	0.04	0.0020
19	765	0.7664	6.6399	0.3744	44.09	0.14	2.49	0.05	0.0021
20	766	0.8074	6.6412	0.4990	44.11	0.25	3.31	0.05	0.0022
21	769	0.8484	6.6451	0.6346	44.16	0.40	4.22	0.05	0.0026
22	770	0.8893	6.6464	0.7891	44.17	0.62	5.24	0.05	0.0027
23	776	0.9303	6.6542	0.9798	44.28	0.96	6.52	0.06	0.0036
24	789	0.9713	6.6708	1.2673	44.50	1.61	8.45	0.08	0.0059
Total	17559	12	158.2581	-13.1673	1043.62	39.45	-85.49	0	0.0571
Mean	731.63	0.50	6.5941	-0.5486	43.48	1.64	-3.56	0	0.0024

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(-85.49) - (158.2581)(-13.1673) = 31.9606$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(1043.62) - (158.2581)^2 = 1.3705$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(39.45) - (-13.1673)^2 = 773.4767$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{31.9606}{\sqrt{1.3705 \times 773.4767}} = 0.9817$$

Lampiran 6
Uji Distribusi Waktu Kerusakan Komponen *Cleaning*

A. Distribusi Normal

i	Ti	F(Ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	809	0.0287	-1.90	654481	3.61	-1537.10	-56.25	3164.06
2	830	0.0697	-1.48	688900	2.19	-1228.40	-35.25	1242.56
3	842	0.1107	-1.22	708964	1.49	-1027.24	-23.25	540.56
4	845	0.1516	-1.03	714025	1.06	-870.35	-20.25	410.06
5	846	0.1926	-0.87	715716	0.76	-736.02	-19.25	370.56
6	847	0.2336	-0.73	717409	0.53	-618.31	-18.25	333.06
7	853	0.2746	-0.60	727609	0.36	-511.80	-12.25	150.06
8	853	0.3156	-0.48	727609	0.23	-409.44	-12.25	150.06
9	853	0.3566	-0.36	727609	0.13	-307.08	-12.25	150.06
10	854	0.3975	-0.26	729316	0.07	-222.04	-11.25	126.56
11	857	0.4385	-0.16	734449	0.03	-137.12	-8.25	68.06
12	864	0.4795	-0.05	746496	0.00	-43.20	-1.25	1.56
13	865	0.5205	0.05	748225	0.00	43.25	-0.25	0.06
14	865	0.5615	0.16	748225	0.03	138.40	-0.25	0.06
15	865	0.6025	0.26	748225	0.07	224.90	-0.25	0.06
16	876	0.6434	0.36	767376	0.13	315.36	10.75	115.56
17	876	0.6844	0.48	767376	0.23	420.48	10.75	115.56
18	878	0.7254	0.60	770884	0.36	526.80	12.75	162.56
19	886	0.7664	0.73	784996	0.53	646.78	20.75	430.56
20	887	0.8074	0.87	786769	0.76	771.69	21.75	473.06
21	889	0.8484	1.03	790321	1.06	915.67	23.75	564.06
22	904	0.8893	1.22	817216	1.49	1102.88	38.75	1501.56
23	909	0.9303	1.48	826281	2.19	1345.32	43.75	1914.06
24	913	0.9713	1.90	833569	3.61	1734.70	47.75	2280.06
Total	20766	12	0	17982046	20.91	538.13	0	14264.50
Mean	865.25	0.50	0	749251.92	0.87	22.42	0	594.35

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(538.13) - (20766)(0) = 12915.12 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(17982046) - (20766)^2 = 342348 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{12915.12}{\sqrt{342348 \times 501.8496}} = 0.9853$$

B. Distribusi Lognormal

i	ti	F(ti)	Ti = LN(ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	809	0.0287	6.6958	-1.90	44.83	3.61	-12.72	-0.0668	0.0045
2	830	0.0697	6.7214	-1.48	45.18	2.19	-9.95	-0.0412	0.0017
3	842	0.1107	6.7358	-1.22	45.37	1.49	-8.22	-0.0268	0.0007
4	845	0.1516	6.7393	-1.03	45.42	1.06	-6.94	-0.0233	0.0005
5	846	0.1926	6.7405	-0.87	45.43	0.76	-5.86	-0.0221	0.0005
6	847	0.2336	6.7417	-0.73	45.45	0.53	-4.92	-0.0209	0.0004
7	853	0.2746	6.7488	-0.60	45.55	0.36	-4.05	-0.0139	0.0002
8	853	0.3156	6.7488	-0.48	45.55	0.23	-3.24	-0.0139	0.0002
9	853	0.3566	6.7488	-0.36	45.55	0.13	-2.43	-0.0139	0.0002
10	854	0.3975	6.7499	-0.26	45.56	0.07	-1.75	-0.0127	0.0002
11	857	0.4385	6.7534	-0.16	45.61	0.03	-1.08	-0.0092	0.0001
12	864	0.4795	6.7616	-0.05	45.72	0.00	-0.34	-0.0010	0.0000
13	865	0.5205	6.7627	0.05	45.73	0.00	0.34	0.0001	0.0000
14	865	0.5615	6.7627	0.16	45.73	0.03	1.08	0.0001	0.0000
15	865	0.6025	6.7627	0.26	45.73	0.07	1.76	0.0001	0.0000
16	876	0.6434	6.7754	0.36	45.91	0.13	2.44	0.0127	0.0002
17	876	0.6844	6.7754	0.48	45.91	0.23	3.25	0.0127	0.0002
18	878	0.7254	6.7776	0.60	45.94	0.36	4.07	0.0150	0.0002
19	886	0.7664	6.7867	0.73	46.06	0.53	4.95	0.0241	0.0006
20	887	0.8074	6.7878	0.87	46.07	0.76	5.91	0.0252	0.0006
21	889	0.8484	6.7901	1.03	46.11	1.06	6.99	0.0275	0.0008
22	904	0.8893	6.8068	1.22	46.33	1.49	8.30	0.0442	0.0020
23	909	0.9303	6.8123	1.48	46.41	2.19	10.08	0.0497	0.0025
24	913	0.9713	6.8167	1.90	46.47	3.61	12.95	0.0541	0.0029
Total	20766	12	162.3029	0	1097.61	20.91	0.62	0	0.0191
Mean	865.25	0.50	6.76262	0	45.73	0.87	0.03	0	0.0008

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i) (\sum_{i=1}^n Y_i) \\ &= 24 (0.62) - (162.3029)(0) = 14.9254 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24 (1097.61) - (162.3029)^2 = 0.4572 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24 (20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}} = \frac{14.9254}{\sqrt{0.4572 \times 501.8496}} = 0.9853$$

C. Distribusi Eksponensial

I	Ti	F(Ti)	Yi = LN [1-F(Ti)]	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	809	0.0287	-0.0291	654481	0.0008	-23.5484	-56.25	3164.06
2	830	0.0697	-0.0722	688900	0.0052	-59.9411	-35.25	1242.56
3	842	0.1107	-0.1173	708964	0.0138	-98.7421	-23.25	540.56
4	845	0.1516	-0.1644	714025	0.0270	-138.9598	-20.25	410.06
5	846	0.1926	-0.2140	715716	0.0458	-181.0140	-19.25	370.56
6	847	0.2336	-0.2661	717409	0.0708	-225.3525	-18.25	333.06
7	853	0.2746	-0.3210	727609	0.1031	-273.8288	-12.25	150.06
8	853	0.3156	-0.3792	727609	0.1438	-323.4358	-12.25	150.06
9	853	0.3566	-0.4409	727609	0.1944	-376.1068	-12.25	150.06
10	854	0.3975	-0.5067	729316	0.2568	-432.7522	-11.25	126.56
11	857	0.4385	-0.5772	734449	0.3331	-494.6495	-8.25	68.06
12	864	0.4795	-0.6530	746496	0.4264	-564.1757	-1.25	1.56
13	865	0.5205	-0.7350	748225	0.5402	-635.7701	-0.25	0.06
14	865	0.5615	-0.8243	748225	0.6795	-713.0536	-0.25	0.06
15	865	0.6025	-0.9225	748225	0.8509	-797.9255	-0.25	0.06
16	876	0.6434	-1.0313	767376	1.0635	-903.3839	10.75	115.56
17	876	0.6844	-1.1534	767376	1.3302	-1010.3458	10.75	115.56
18	878	0.7254	-1.2925	770884	1.6705	-1134.7936	12.75	162.56
19	886	0.7664	-1.4541	784996	2.1145	-1288.3476	20.75	430.56
20	887	0.8074	-1.6470	786769	2.7127	-1460.9073	21.75	473.06
21	889	0.8484	-1.8863	790321	3.5579	-1676.8765	23.75	564.06
22	904	0.8893	-2.2013	817216	4.8459	-1990.0035	38.75	1501.56
23	909	0.9303	-2.6640	826281	7.0967	-2421.5350	43.75	1914.06
24	913	0.9713	-3.5513	833569	12.6114	-3242.2986	47.75	2280.06
Total	20766	12	-23.1039	17982046	40.6949	-20467.75	0	14264.50
Mean	865.25	0.50	-0.9627	749251.92	1.6956	-852.82	0	594.35

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(-20467.75) - (20766)(-23.1039) = -11450.11$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(17982046) - (20766)^2 = 342348$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(40.6949) - (-23.1039)^2 = 442.8872$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{-11450.11}{\sqrt{342348 \times 442.8872}} = -0.9299$$

D. Distribusi Weibull

i	Ti	F(ti)	Ti = LN (ti)	Yi = LN{-LN [1-F(Ti)]}	Ti ²	Yi ²	Ti.Yi	Ti- \check{T} i	(Ti- \check{T} i) ²
1	809	0.0287	6.6958	-3.5367	44.83	12.51	-23.68	-0.0668	0.0045
2	830	0.0697	6.7214	-2.6281	45.18	6.91	-17.66	-0.0412	0.0017
3	842	0.1107	6.7358	-2.1433	45.37	4.59	-14.44	-0.0268	0.0007
4	845	0.1516	6.7393	-1.8052	45.42	3.26	-12.17	-0.0233	0.0005
5	846	0.1926	6.7405	-1.5419	45.43	2.38	-10.39	-0.0221	0.0005
6	847	0.2336	6.7417	-1.3240	45.45	1.75	-8.93	-0.0209	0.0004
7	853	0.2746	6.7488	-1.1363	45.55	1.29	-7.67	-0.0139	0.0002
8	853	0.3156	6.7488	-0.9698	45.55	0.94	-6.54	-0.0139	0.0002
9	853	0.3566	6.7488	-0.8189	45.55	0.67	-5.53	-0.0139	0.0002
10	854	0.3975	6.7499	-0.6798	45.56	0.46	-4.59	-0.0127	0.0002
11	857	0.4385	6.7534	-0.5496	45.61	0.30	-3.71	-0.0092	0.0001
12	864	0.4795	6.7616	-0.4262	45.72	0.18	-2.88	-0.0010	0.0000
13	865	0.5205	6.7627	-0.3079	45.73	0.09	-2.08	0.0001	0.0000
14	865	0.5615	6.7627	-0.1932	45.73	0.04	-1.31	0.0001	0.0000
15	865	0.6025	6.7627	-0.0807	45.73	0.01	-0.55	0.0001	0.0000
16	876	0.6434	6.7754	0.0308	45.91	0.00	0.21	0.0127	0.0002
17	876	0.6844	6.7754	0.1427	45.91	0.02	0.97	0.0127	0.0002
18	878	0.7254	6.7776	0.2566	45.94	0.07	1.74	0.0150	0.0002
19	886	0.7664	6.7867	0.3744	46.06	0.14	2.54	0.0241	0.0006
20	887	0.8074	6.7878	0.4990	46.07	0.25	3.39	0.0252	0.0006
21	889	0.8484	6.7901	0.6346	46.11	0.40	4.31	0.0275	0.0008
22	904	0.8893	6.8068	0.7891	46.33	0.62	5.37	0.0442	0.0020
23	909	0.9303	6.8123	0.9798	46.41	0.96	6.67	0.0497	0.0025
24	913	0.9713	6.8167	1.2673	46.47	1.61	8.64	0.0541	0.0029
Total	20766	12	162.3029	-13.1673	1097.61	39.45	-88.29	0	0.0191
Mean	865.25	0.50	6.7626	-0.5486	45.73	1.64	-3.68	0	0.0008

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i) (\sum_{i=1}^n Y_i) \\ = 24(-88.29) - (162.3029)(-13.1673) = 18.1880$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(1097.61) - (162.3029)^2 = 0.4572$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(39.45) - (-13.1673)^2 = 773.4767$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{18.1889}{\sqrt{0.4572 \times 773.4767}} = 0.9671$$

Lampiran 6
Uji Distribusi Waktu Kerusakan Komponen *Module Punch*

A. Distribusi Normal

i	Ti	F(Ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	727	0.0287	-1.90	528529	3.61	-1381.30	-46.38	2150.64
2	731	0.0697	-1.48	534361	2.19	-1081.88	-42.38	1795.64
3	745	0.1107	-1.22	555025	1.49	-908.90	-28.38	805.14
4	746	0.1516	-1.03	556516	1.06	-768.38	-27.38	749.39
5	754	0.1926	-0.87	568516	0.76	-655.98	-19.38	375.39
6	754	0.2336	-0.73	568516	0.53	-550.42	-19.38	375.39
7	765	0.2746	-0.60	585225	0.36	-459.00	-8.38	70.14
8	765	0.3156	-0.48	585225	0.23	-367.20	-8.38	70.14
9	765	0.3566	-0.36	585225	0.13	-275.40	-8.38	70.14
10	765	0.3975	-0.26	585225	0.07	-198.90	-8.38	70.14
11	765	0.4385	-0.16	585225	0.03	-122.40	-8.38	70.14
12	776	0.4795	-0.05	602176	0.00	-38.80	2.63	6.89
13	776	0.5205	0.05	602176	0.00	38.80	2.63	6.89
14	776	0.5615	0.16	602176	0.03	124.16	2.63	6.89
15	780	0.6025	0.26	608400	0.07	202.80	6.63	43.89
16	786	0.6434	0.36	617796	0.13	282.96	12.63	159.39
17	786	0.6844	0.48	617796	0.23	377.28	12.63	159.39
18	786	0.7254	0.60	617796	0.36	471.60	12.63	159.39
19	790	0.7664	0.73	624100	0.53	576.70	16.63	276.39
20	798	0.8074	0.87	636804	0.76	694.26	24.63	606.39
21	804	0.8484	1.03	646416	1.06	828.12	30.63	937.89
22	806	0.8893	1.22	649636	1.49	983.32	32.63	1064.39
23	807	0.9303	1.48	651249	2.19	1194.36	33.63	1130.64
24	808	0.9713	1.90	652864	3.61	1535.20	34.63	1198.89
Total	18561	12	0	14366973	20.91	501	0	12359.625
Mean	773.38	0.50	0	598623.88	0.87	20.88	0	514.98

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(501) - (18561)(0) = 12024 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(14366973) - (18561)^2 = 296631 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{12024}{\sqrt{296631 \times 501.8496}} = 0.9855$$

B. Distribusi Lognormal

i	ti	F(ti)	Ti = LN(ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	727	0.0287	6.5889	-1.90	43.41	3.61	-12.52	-0.0614	0.0038
2	731	0.0697	6.5944	-1.48	43.49	2.19	-9.76	-0.0559	0.0031
3	745	0.1107	6.6134	-1.22	43.74	1.49	-8.07	-0.0369	0.0014
4	746	0.1516	6.6147	-1.03	43.75	1.06	-6.81	-0.0356	0.0013
5	754	0.1926	6.6254	-0.87	43.90	0.76	-5.76	-0.0249	0.0006
6	754	0.2336	6.6254	-0.73	43.90	0.53	-4.84	-0.0249	0.0006
7	765	0.2746	6.6399	-0.60	44.09	0.36	-3.98	-0.0105	0.0001
8	765	0.3156	6.6399	-0.48	44.09	0.23	-3.19	-0.0105	0.0001
9	765	0.3566	6.6399	-0.36	44.09	0.13	-2.39	-0.0105	0.0001
10	765	0.3975	6.6399	-0.26	44.09	0.07	-1.73	-0.0105	0.0001
11	765	0.4385	6.6399	-0.16	44.09	0.03	-1.06	-0.0105	0.0001
12	776	0.4795	6.6542	-0.05	44.28	0.00	-0.33	0.0038	0.0000
13	776	0.5205	6.6542	0.05	44.28	0.00	0.33	0.0038	0.0000
14	776	0.5615	6.6542	0.16	44.28	0.03	1.06	0.0038	0.0000
15	780	0.6025	6.6593	0.26	44.35	0.07	1.73	0.0090	0.0001
16	786	0.6434	6.6670	0.36	44.45	0.13	2.40	0.0166	0.0003
17	786	0.6844	6.6670	0.48	44.45	0.23	3.20	0.0166	0.0003
18	786	0.7254	6.6670	0.60	44.45	0.36	4.00	0.0166	0.0003
19	790	0.7664	6.6720	0.73	44.52	0.53	4.87	0.0217	0.0005
20	798	0.8074	6.6821	0.87	44.65	0.76	5.81	0.0318	0.0010
21	804	0.8484	6.6896	1.03	44.75	1.06	6.89	0.0393	0.0015
22	806	0.8893	6.6921	1.22	44.78	1.49	8.16	0.0418	0.0017
23	807	0.9303	6.6933	1.48	44.80	2.19	9.91	0.0430	0.0018
24	808	0.9713	6.6946	1.90	44.82	3.61	12.72	0.0442	0.0020
Total	18561	12	159.6079	0	1061.47	20.91	0.65	0	0.0208
Mean	773.38	0.50	6.6503	0	44.23	0.87	0.03	0	0.0009

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i) (\sum_{i=1}^n Y_i) \\ = 24 (0.65) - (159.6079)(0) = 15.5988$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24 (1061.47) - (159.6079)^2 = 0.5003$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24 (20.91) - (0)^2 = 501.8496$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}} = \frac{15.5988}{\sqrt{0.5003 \times 501.8496}} = 0.9845$$

C. Distribusi Eksponensial

I	Ti	F(Ti)	Yi = LN [1-F(Ti)]	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	727	0.0287	-0.0291	528529	0.0008	-21.1616	-46.38	2150.64
2	731	0.0697	-0.0722	534361	0.0052	-52.7915	-42.38	1795.64
3	745	0.1107	-0.1173	555025	0.0138	-87.3668	-28.38	805.14
4	746	0.1516	-0.1644	556516	0.0270	-122.6793	-27.38	749.39
5	754	0.1926	-0.2140	568516	0.0458	-161.3292	-19.38	375.39
6	754	0.2336	-0.2661	568516	0.0708	-200.6089	-19.38	375.39
7	765	0.2746	-0.3210	585225	0.1031	-245.5791	-8.38	70.14
8	765	0.3156	-0.3792	585225	0.1438	-290.0684	-8.38	70.14
9	765	0.3566	-0.4409	585225	0.1944	-337.3057	-8.38	70.14
10	765	0.3975	-0.5067	585225	0.2568	-387.6528	-8.38	70.14
11	765	0.4385	-0.5772	585225	0.3331	-441.5483	-8.38	70.14
12	776	0.4795	-0.6530	602176	0.4264	-506.7134	2.63	6.89
13	776	0.5205	-0.7350	602176	0.5402	-570.3556	2.63	6.89
14	776	0.5615	-0.8243	602176	0.6795	-639.6874	2.63	6.89
15	780	0.6025	-0.9225	608400	0.8509	-719.5167	6.63	43.89
16	786	0.6434	-1.0313	617796	1.0635	-810.5704	12.63	159.39
17	786	0.6844	-1.1534	617796	1.3302	-906.5432	12.63	159.39
18	786	0.7254	-1.2925	617796	1.6705	-1015.8858	12.63	159.39
19	790	0.7664	-1.4541	624100	2.1145	-1148.7524	16.63	276.39
20	798	0.8074	-1.6470	636804	2.7127	-1314.3225	24.63	606.39
21	804	0.8484	-1.8863	646416	3.5579	-1516.5453	30.63	937.89
22	806	0.8893	-2.2013	649636	4.8459	-1774.2731	32.63	1064.39
23	807	0.9303	-2.6640	651249	7.0967	-2149.8116	33.63	1130.64
24	808	0.9713	-3.5513	652864	12.6114	-2869.4165	34.63	1198.89
Total	18561	12	-23.1039	14366973	40.6949	-18290.49	0	12359.63
Mean	773.38	0.50	-0.9627	598623.88	1.6956	-762.10	0	514.98

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(-18290.49) - (18561)(-23.1039) = -10139.9$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(14366973) - (18561)^2 = 296631$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(40.6949) - (-23.1039)^2 = 442.8872$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{10139.9}{\sqrt{296631 \times 442.8872}} = -0.8847$$

D. Distribusi Weibull

i	ti	F(ti)	Ti = LN (ti)	Yi = LN{-LN [1-F(Ti)]}	Ti ²	Yi ²	Ti.Yi	Ti- \check{T} i	(Ti- \check{T} i) ²
1	727	0.0287	6.5889	-3.5367	43.41	12.51	-23.30	-0.0614	0.0038
2	731	0.0697	6.5944	-2.6281	43.49	6.91	-17.33	-0.0559	0.0031
3	745	0.1107	6.6134	-2.1433	43.74	4.59	-14.17	-0.0369	0.0014
4	746	0.1516	6.6147	-1.8052	43.75	3.26	-11.94	-0.0356	0.0013
5	754	0.1926	6.6254	-1.5419	43.90	2.38	-10.22	-0.0249	0.0006
6	754	0.2336	6.6254	-1.3240	43.90	1.75	-8.77	-0.0249	0.0006
7	765	0.2746	6.6399	-1.1363	44.09	1.29	-7.54	-0.0105	0.0001
8	765	0.3156	6.6399	-0.9698	44.09	0.94	-6.44	-0.0105	0.0001
9	765	0.3566	6.6399	-0.8189	44.09	0.67	-5.44	-0.0105	0.0001
10	765	0.3975	6.6399	-0.6798	44.09	0.46	-4.51	-0.0105	0.0001
11	765	0.4385	6.6399	-0.5496	44.09	0.30	-3.65	-0.0105	0.0001
12	776	0.4795	6.6542	-0.4262	44.28	0.18	-2.84	0.0038	0.0000
13	776	0.5205	6.6542	-0.3079	44.28	0.09	-2.05	0.0038	0.0000
14	776	0.5615	6.6542	-0.1932	44.28	0.04	-1.29	0.0038	0.0000
15	780	0.6025	6.6593	-0.0807	44.35	0.01	-0.54	0.0090	0.0001
16	786	0.6434	6.6670	0.0308	44.45	0.00	0.21	0.0166	0.0003
17	786	0.6844	6.6670	0.1427	44.45	0.02	0.95	0.0166	0.0003
18	786	0.7254	6.6670	0.2566	44.45	0.07	1.71	0.0166	0.0003
19	790	0.7664	6.6720	0.3744	44.52	0.14	2.50	0.0217	0.0005
20	798	0.8074	6.6821	0.4990	44.65	0.25	3.33	0.0318	0.0010
21	804	0.8484	6.6896	0.6346	44.75	0.40	4.25	0.0393	0.0015
22	806	0.8893	6.6921	0.7891	44.78	0.62	5.28	0.0418	0.0017
23	807	0.9303	6.6933	0.9798	44.80	0.96	6.56	0.0430	0.0018
24	808	0.9713	6.6946	1.2673	44.82	1.61	8.48	0.0442	0.0020
Total	18561	12	159.6079	-13.1673	1061.47	39.45	-86.76	0	0.0208
Mean	773.38	0.50	6.65	-0.55	44.23	1.64	-3.62	0	0.0009

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(-86.76) - (159.6079)(-13.1673) = 19.3296$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(1061.47) - (159.6079)^2 = 0.5003$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(39.45) - (-13.1673)^2 = 773.4767$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{19.3296}{\sqrt{0.5003 \times 773.4767}} = 0.9826$$

Lampiran 6
Uji Distribusi Waktu Kerusakan Komponen *Tacking*

A. Distribusi Normal

I	Ti	F(Ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	323	0.0287	-1.90	104329	3.61	-613.70	-65.08	4235.84
2	342	0.0697	-1.48	116964	2.19	-506.16	-46.08	2123.67
3	343	0.1107	-1.22	117649	1.49	-418.46	-45.08	2032.51
4	356	0.1516	-1.03	126736	1.06	-366.68	-32.08	1029.34
5	365	0.1926	-0.87	133225	0.76	-317.55	-23.08	532.84
6	365	0.2336	-0.73	133225	0.53	-266.45	-23.08	532.84
7	367	0.2746	-0.60	134689	0.36	-220.20	-21.08	444.51
8	367	0.3156	-0.48	134689	0.23	-176.16	-21.08	444.51
9	376	0.3566	-0.36	141376	0.13	-135.36	-12.08	146.01
10	379	0.3975	-0.26	143641	0.07	-98.54	-9.08	82.51
11	387	0.4385	-0.16	149769	0.03	-61.92	-1.08	1.17
12	395	0.4795	-0.05	156025	0.00	-19.75	6.92	47.84
13	397	0.5205	0.05	157609	0.00	19.85	8.92	79.51
14	397	0.5615	0.16	157609	0.03	63.52	8.92	79.51
15	397	0.6025	0.26	157609	0.07	103.22	8.92	79.51
16	401	0.6434	0.36	160801	0.13	144.36	12.92	166.84
17	403	0.6844	0.48	162409	0.23	193.44	14.92	222.51
18	405	0.7254	0.60	164025	0.36	243.00	16.92	286.17
19	411	0.7664	0.73	168921	0.53	300.03	22.92	525.17
20	413	0.8074	0.87	170569	0.76	359.31	24.92	620.84
21	421	0.8484	1.03	177241	1.06	433.63	32.92	1083.51
22	433	0.8893	1.22	187489	1.49	528.26	44.92	2017.51
23	435	0.9303	1.48	189225	2.19	643.80	46.92	2201.17
24	436	0.9713	1.90	190096	3.61	828.40	47.92	2296.01
Total	9314	12	0	3635920	20.91	659.89	0	21311.8333
Mean	388.08	0.50	0	151496.67	0.87	27.50	0	887.99

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(659.89) - (9314)(0) = 15837.36 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(3635920) - (9314)^2 = 511484 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{15837.36}{\sqrt{511484 \times 501.8496}} = 0.9885$$

B. Distribusi Lognormal

I	ti	F(ti)	Ti = LN(ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	323	0.0287	5.7777	-1.90	33.38	3.61	-10.98	-0.1806	0.0326
2	342	0.0697	5.8348	-1.48	34.05	2.19	-8.64	-0.1234	0.0152
3	343	0.1107	5.8377	-1.22	34.08	1.49	-7.12	-0.1205	0.0145
4	356	0.1516	5.8749	-1.03	34.51	1.06	-6.05	-0.0833	0.0069
5	365	0.1926	5.8999	-0.87	34.81	0.76	-5.13	-0.0583	0.0034
6	365	0.2336	5.8999	-0.73	34.81	0.53	-4.31	-0.0583	0.0034
7	367	0.2746	5.9054	-0.60	34.87	0.36	-3.54	-0.0528	0.0028
8	367	0.3156	5.9054	-0.48	34.87	0.23	-2.83	-0.0528	0.0028
9	376	0.3566	5.9296	-0.36	35.16	0.13	-2.13	-0.0286	0.0008
10	379	0.3975	5.9375	-0.26	35.25	0.07	-1.54	-0.0207	0.0004
11	387	0.4385	5.9584	-0.16	35.50	0.03	-0.95	0.0002	0.0000
12	395	0.4795	5.9789	-0.05	35.75	0.00	-0.30	0.0207	0.0004
13	397	0.5205	5.9839	0.05	35.81	0.00	0.30	0.0257	0.0007
14	397	0.5615	5.9839	0.16	35.81	0.03	0.96	0.0257	0.0007
15	397	0.6025	5.9839	0.26	35.81	0.07	1.56	0.0257	0.0007
16	401	0.6434	5.9940	0.36	35.93	0.13	2.16	0.0358	0.0013
17	403	0.6844	5.9989	0.48	35.99	0.23	2.88	0.0407	0.0017
18	405	0.7254	6.0039	0.60	36.05	0.36	3.60	0.0457	0.0021
19	411	0.7664	6.0186	0.73	36.22	0.53	4.39	0.0604	0.0036
20	413	0.8074	6.0234	0.87	36.28	0.76	5.24	0.0652	0.0043
21	421	0.8484	6.0426	1.03	36.51	1.06	6.22	0.0844	0.0071
22	433	0.8893	6.0707	1.22	36.85	1.49	7.41	0.1125	0.0127
23	435	0.9303	6.0753	1.48	36.91	2.19	8.99	0.1171	0.0137
24	436	0.9713	6.0776	1.90	36.94	3.61	11.55	0.1194	0.0143
Total	9314	12	142.9971	0	852.15	20.91	1.72	0	0.1460
Mean	388.08	0.50	5.9582	0	35.51	0.87	0.07	0	0.0061

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(1.72) - (142.9971)(0) = 41.2972 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(852.15) - (142.9971)^2 = 3.5046 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{41.2972}{\sqrt{3.5046 \times 501.8496}} = 0.9847$$

C. Distribusi Eksponensial

I	Ti	F(Ti)	Yi = LN [1-F(Ti)]	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	323	0.0287	-0.0291	104329	0.0008	-9.4019	-65.08	4235.84
2	342	0.0697	-0.0722	116964	0.0052	-24.6986	-46.08	2123.67
3	343	0.1107	-0.1173	117649	0.0138	-40.2239	-45.08	2032.51
4	356	0.1516	-0.1644	126736	0.0270	-58.5440	-32.08	1029.34
5	365	0.1926	-0.2140	133225	0.0458	-78.0970	-23.08	532.84
6	365	0.2336	-0.2661	133225	0.0708	-97.1118	-23.08	532.84
7	367	0.2746	-0.3210	134689	0.1031	-117.8138	-21.08	444.51
8	367	0.3156	-0.3792	134689	0.1438	-139.1570	-21.08	444.51
9	376	0.3566	-0.4409	141376	0.1944	-165.7868	-12.08	146.01
10	379	0.3975	-0.5067	143641	0.2568	-192.0528	-9.08	82.51
11	387	0.4385	-0.5772	149769	0.3331	-223.3715	-1.08	1.17
12	395	0.4795	-0.6530	156025	0.4264	-257.9275	6.92	47.84
13	397	0.5205	-0.7350	157609	0.5402	-291.7927	8.92	79.51
14	397	0.5615	-0.8243	157609	0.6795	-327.2627	8.92	79.51
15	397	0.6025	-0.9225	157609	0.8509	-366.2155	8.92	79.51
16	401	0.6434	-1.0313	160801	1.0635	-413.5353	12.92	166.84
17	403	0.6844	-1.1534	162409	1.3302	-464.8052	14.92	222.51
18	405	0.7254	-1.2925	164025	1.6705	-523.4526	16.92	286.17
19	411	0.7664	-1.4541	168921	2.1145	-597.6421	22.92	525.17
20	413	0.8074	-1.6470	170569	2.7127	-680.2195	24.92	620.84
21	421	0.8484	-1.8863	177241	3.5579	-794.1114	32.92	1083.51
22	433	0.8893	-2.2013	187489	4.8459	-953.1765	44.92	2017.51
23	435	0.9303	-2.6640	189225	7.0967	-1158.8204	46.92	2201.17
24	436	0.9713	-3.5513	190096	12.6114	-1548.3485	47.92	2296.01
Total	9314	12	-23.1039	3635920	40.6949	-9523.57	0	21311.83
Mean	388.08	0.50	-0.9627	151496.67	1.6956	-396.82	0	887.99

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(-9523.57) - (9314)(-23.1039) = -13375.8 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(3635920) - (9314)^2 = 511484 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(40.6949) - (-23.1039)^2 = 442.8872 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{-13375.8}{\sqrt{511484 \times 442.8872}} = -0.8887$$

D. Distribusi Weibull

i	Ti	F(ti)	Ti = LN (ti)	Yi = LN{-LN [1-F(Ti)]}	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	323	0.0287	5.7777	-3.5367	33.38	12.51	-20.43	-0.1806	0.0326
2	342	0.0697	5.8348	-2.6281	34.05	6.91	-15.33	-0.1234	0.0152
3	343	0.1107	5.8377	-2.1433	34.08	4.59	-12.51	-0.1205	0.0145
4	356	0.1516	5.8749	-1.8052	34.51	3.26	-10.61	-0.0833	0.0069
5	365	0.1926	5.8999	-1.5419	34.81	2.38	-9.10	-0.0583	0.0034
6	365	0.2336	5.8999	-1.3240	34.81	1.75	-7.81	-0.0583	0.0034
7	367	0.2746	5.9054	-1.1363	34.87	1.29	-6.71	-0.0528	0.0028
8	367	0.3156	5.9054	-0.9698	34.87	0.94	-5.73	-0.0528	0.0028
9	376	0.3566	5.9296	-0.8189	35.16	0.67	-4.86	-0.0286	0.0008
10	379	0.3975	5.9375	-0.6798	35.25	0.46	-4.04	-0.0207	0.0004
11	387	0.4385	5.9584	-0.5496	35.50	0.30	-3.27	0.0002	0.0000
12	395	0.4795	5.9789	-0.4262	35.75	0.18	-2.55	0.0207	0.0004
13	397	0.5205	5.9839	-0.3079	35.81	0.09	-1.84	0.0257	0.0007
14	397	0.5615	5.9839	-0.1932	35.81	0.04	-1.16	0.0257	0.0007
15	397	0.6025	5.9839	-0.0807	35.81	0.01	-0.48	0.0257	0.0007
16	401	0.6434	5.9940	0.0308	35.93	0.00	0.18	0.0358	0.0013
17	403	0.6844	5.9989	0.1427	35.99	0.02	0.86	0.0407	0.0017
18	405	0.7254	6.0039	0.2566	36.05	0.07	1.54	0.0457	0.0021
19	411	0.7664	6.0186	0.3744	36.22	0.14	2.25	0.0604	0.0036
20	413	0.8074	6.0234	0.4990	36.28	0.25	3.01	0.0652	0.0043
21	421	0.8484	6.0426	0.6346	36.51	0.40	3.83	0.0844	0.0071
22	433	0.8893	6.0707	0.7891	36.85	0.62	4.79	0.1125	0.0127
23	435	0.9303	6.0753	0.9798	36.91	0.96	5.95	0.1171	0.0137
24	436	0.9713	6.0776	1.2673	36.94	1.61	7.70	0.1194	0.0143
Total	9314	12	142.9971	-13.1673	852.15	39.45	-76.31	0	0.1460
Mean	388.08	0.50	5.9582	-0.5486	35.51	1.64	-3.18	0	0.0061

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(-76.31) - (142.9971)(-13.1673) = 51.4981$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(852.15) - (142.9971)^2 = 3.5046$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(39.45) - (-13.1673)^2 = 773.4767$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{51.4981}{\sqrt{3.5046 \times 773.4767}} = 0.9891$$

Lampiran 6
Uji Distribusi Waktu Kerusakan Komponen *Welding*

A. Distribusi Normal

I	Ti	F(Ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	543	0.0287	-1.90	294849	3.61	-1031.70	-34.54	1193.13
2	545	0.0697	-1.48	297025	2.19	-806.60	-32.54	1058.96
3	546	0.1107	-1.22	298116	1.49	-666.12	-31.54	994.88
4	557	0.1516	-1.03	310249	1.06	-573.71	-20.54	421.96
5	565	0.1926	-0.87	319225	0.76	-491.55	-12.54	157.29
6	565	0.2336	-0.73	319225	0.53	-412.45	-12.54	157.29
7	567	0.2746	-0.60	321489	0.36	-340.20	-10.54	111.13
8	567	0.3156	-0.48	321489	0.23	-272.16	-10.54	111.13
9	568	0.3566	-0.36	322624	0.13	-204.48	-9.54	91.04
10	574	0.3975	-0.26	329476	0.07	-149.24	-3.54	12.54
11	575	0.4385	-0.16	330625	0.03	-92.00	-2.54	6.46
12	576	0.4795	-0.05	331776	0.00	-28.80	-1.54	2.38
13	576	0.5205	0.05	331776	0.00	28.80	-1.54	2.38
14	576	0.5615	0.16	331776	0.03	92.16	-1.54	2.38
15	576	0.6025	0.26	331776	0.07	149.76	-1.54	2.38
16	579	0.6434	0.36	335241	0.13	208.44	1.46	2.13
17	582	0.6844	0.48	338724	0.23	279.36	4.46	19.88
18	587	0.7254	0.60	344569	0.36	352.20	9.46	89.46
19	587	0.7664	0.73	344569	0.53	428.51	9.46	89.46
20	599	0.8074	0.87	358801	0.76	521.13	21.46	460.46
21	606	0.8484	1.03	367236	1.06	624.18	28.46	809.88
22	607	0.8893	1.22	368449	1.49	740.54	29.46	867.79
23	616	0.9303	1.48	379456	2.19	911.68	38.46	1479.04
24	622	0.9713	1.90	386884	3.61	1181.80	44.46	1976.54
Total	13861	12	0	8015425	20.91	449.55	0	10119.9583
Mean	577.54	0.50	0	333976.04	0.87	18.73	0	421.66

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(449.55) - (13861)(0) = 10789.2 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(8015425) - (13861)^2 = 242879 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{10789.2}{\sqrt{242879 \times 501.8496}} = 0.9773$$

B. Distribusi Lognormal

i	ti	F(ti)	Ti = LN(ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	543	0.0287	6.2971	-1.90	39.65	3.61	-11.96	-0.0610	0.0037
2	545	0.0697	6.3008	-1.48	39.70	2.19	-9.33	-0.0574	0.0033
3	546	0.1107	6.3026	-1.22	39.72	1.49	-7.69	-0.0555	0.0031
4	557	0.1516	6.3226	-1.03	39.97	1.06	-6.51	-0.0356	0.0013
5	565	0.1926	6.3368	-0.87	40.16	0.76	-5.51	-0.0213	0.0005
6	565	0.2336	6.3368	-0.73	40.16	0.53	-4.63	-0.0213	0.0005
7	567	0.2746	6.3404	-0.60	40.20	0.36	-3.80	-0.0178	0.0003
8	567	0.3156	6.3404	-0.48	40.20	0.23	-3.04	-0.0178	0.0003
9	568	0.3566	6.3421	-0.36	40.22	0.13	-2.28	-0.0160	0.0003
10	574	0.3975	6.3526	-0.26	40.36	0.07	-1.65	-0.0055	0.0000
11	575	0.4385	6.3544	-0.16	40.38	0.03	-1.02	-0.0038	0.0000
12	576	0.4795	6.3561	-0.05	40.40	0.00	-0.32	-0.0020	0.0000
13	576	0.5205	6.3561	0.05	40.40	0.00	0.32	-0.0020	0.0000
14	576	0.5615	6.3561	0.16	40.40	0.03	1.02	-0.0020	0.0000
15	576	0.6025	6.3561	0.26	40.40	0.07	1.65	-0.0020	0.0000
16	579	0.6434	6.3613	0.36	40.47	0.13	2.29	0.0031	0.0000
17	582	0.6844	6.3665	0.48	40.53	0.23	3.06	0.0083	0.0001
18	587	0.7254	6.3750	0.60	40.64	0.36	3.83	0.0169	0.0003
19	587	0.7664	6.3750	0.73	40.64	0.53	4.65	0.0169	0.0003
20	599	0.8074	6.3953	0.87	40.90	0.76	5.56	0.0371	0.0014
21	606	0.8484	6.4069	1.03	41.05	1.06	6.60	0.0487	0.0024
22	607	0.8893	6.4085	1.22	41.07	1.49	7.82	0.0504	0.0025
23	616	0.9303	6.4232	1.48	41.26	2.19	9.51	0.0651	0.0042
24	622	0.9713	6.4329	1.90	41.38	3.61	12.22	0.0748	0.0056
Total	13861	12	152.5957	0	970.26	20.91	0.78	0	0.0300
Mean	577.54	0.50	6.3582	0	40.43	0.87	0.03	0	0.0012

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i) (\sum_{i=1}^n Y_i) \\ &= 24 (0.78) - (152.5957)(0) = 18.6125 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24 (970.26) - (152.5957)^2 = 0.7199 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24 (20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}} = \frac{18.6125}{\sqrt{0.7199 \times 501.8496}} = 0.9792$$

C. Distribusi Eksponensial

I	Ti	F(Ti)	Yi = LN [1-F(Ti)]	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	543	0.0287	-0.0291	294849	0.0008	-15.8057	-34.54	1193.13
2	545	0.0697	-0.0722	297025	0.0052	-39.3589	-32.54	1058.96
3	546	0.1107	-0.1173	298116	0.0138	-64.0299	-31.54	994.88
4	557	0.1516	-0.1644	310249	0.0270	-91.5983	-20.54	421.96
5	565	0.1926	-0.2140	319225	0.0458	-120.8899	-12.54	157.29
6	565	0.2336	-0.2661	319225	0.0708	-150.3237	-12.54	157.29
7	567	0.2746	-0.3210	321489	0.1031	-182.0175	-10.54	111.13
8	567	0.3156	-0.3792	321489	0.1438	-214.9919	-10.54	111.13
9	568	0.3566	-0.4409	322624	0.1944	-250.4439	-9.54	91.04
10	574	0.3975	-0.5067	329476	0.2568	-290.8663	-3.54	12.54
11	575	0.4385	-0.5772	330625	0.3331	-331.8827	-2.54	6.46
12	576	0.4795	-0.6530	331776	0.4264	-376.1171	-1.54	2.38
13	576	0.5205	-0.7350	331776	0.5402	-423.3567	-1.54	2.38
14	576	0.5615	-0.8243	331776	0.6795	-474.8195	-1.54	2.38
15	576	0.6025	-0.9225	331776	0.8509	-531.3354	-1.54	2.38
16	579	0.6434	-1.0313	335241	1.0635	-597.0996	1.46	2.13
17	582	0.6844	-1.1534	338724	1.3302	-671.2572	4.46	19.88
18	587	0.7254	-1.2925	344569	1.6705	-758.6832	9.46	89.46
19	587	0.7664	-1.4541	344569	2.1145	-853.5667	9.46	89.46
20	599	0.8074	-1.6470	358801	2.7127	-986.5654	21.46	460.46
21	606	0.8484	-1.8863	367236	3.5579	-1143.0677	28.46	809.88
22	607	0.8893	-2.2013	368449	4.8459	-1336.2081	29.46	867.79
23	616	0.9303	-2.6640	379456	7.0967	-1640.9962	38.46	1479.04
24	622	0.9713	-3.5513	386884	12.6114	-2208.8825	44.46	1976.54
Total	13861	12	-23.1039	8015425	40.6949	-13754.16	0	10119.958
Mean	577.54	0.50	-0.9627	333976.04	1.6956	-573.09	0	421.66

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(-13754.16) - (13861)(-23.1039) = -9856.61$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(8015425) - (13861)^2 = 242879$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(40.6949) - (-23.1039)^2 = 442.8872$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{-9856.61}{\sqrt{242879 \times 442.8872}} = -0.95036$$

D. Distribusi Weibull

i	ti	F(ti)	Ti = LN (ti)	Yi = LN{-LN [1-F(Ti)]}	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	543	0.0287	6.2971	-3.5367	39.65	12.51	-22.27	-0.0610	0.0037
2	545	0.0697	6.3008	-2.6281	39.70	6.91	-16.56	-0.0574	0.0033
3	546	0.1107	6.3026	-2.1433	39.72	4.59	-13.51	-0.0555	0.0031
4	557	0.1516	6.3226	-1.8052	39.97	3.26	-11.41	-0.0356	0.0013
5	565	0.1926	6.3368	-1.5419	40.16	2.38	-9.77	-0.0213	0.0005
6	565	0.2336	6.3368	-1.3240	40.16	1.75	-8.39	-0.0213	0.0005
7	567	0.2746	6.3404	-1.1363	40.20	1.29	-7.20	-0.0178	0.0003
8	567	0.3156	6.3404	-0.9698	40.20	0.94	-6.15	-0.0178	0.0003
9	568	0.3566	6.3421	-0.8189	40.22	0.67	-5.19	-0.0160	0.0003
10	574	0.3975	6.3526	-0.6798	40.36	0.46	-4.32	-0.0055	0.0000
11	575	0.4385	6.3544	-0.5496	40.38	0.30	-3.49	-0.0038	0.0000
12	576	0.4795	6.3561	-0.4262	40.40	0.18	-2.71	-0.0020	0.0000
13	576	0.5205	6.3561	-0.3079	40.40	0.09	-1.96	-0.0020	0.0000
14	576	0.5615	6.3561	-0.1932	40.40	0.04	-1.23	-0.0020	0.0000
15	576	0.6025	6.3561	-0.0807	40.40	0.01	-0.51	-0.0020	0.0000
16	579	0.6434	6.3613	0.0308	40.47	0.00	0.20	0.0031	0.0000
17	582	0.6844	6.3665	0.1427	40.53	0.02	0.91	0.0083	0.0001
18	587	0.7254	6.3750	0.2566	40.64	0.07	1.64	0.0169	0.0003
19	587	0.7664	6.3750	0.3744	40.64	0.14	2.39	0.0169	0.0003
20	599	0.8074	6.3953	0.4990	40.90	0.25	3.19	0.0371	0.0014
21	606	0.8484	6.4069	0.6346	41.05	0.40	4.07	0.0487	0.0024
22	607	0.8893	6.4085	0.7891	41.07	0.62	5.06	0.0504	0.0025
23	616	0.9303	6.4232	0.9798	41.26	0.96	6.29	0.0651	0.0042
24	622	0.9713	6.4329	1.2673	41.38	1.61	8.15	0.0748	0.0056
Total	13861	12	152.5957	-13.1673	970.26	39.45	-82.79	0	0.0300
Mean	577.54	0.50	6.3582	-0.5486	40.43	1.64	-3.45	0	0.0012

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i) (\sum_{i=1}^n Y_i) \\ = 24(-82.79) - (152.5957)(-13.1673) = 22.3014$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(970.26) - (152.5957)^2 = 0.7199$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(39.45) - (-13.1673)^2 = 773.4767$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}} = \frac{22.3014}{\sqrt{0.7199 \times 773.4767}} = 0.9451$$

Lampiran 7
Uji Distribusi Waktu Perbaikan Komponen CID (*Card Input Device*)

A. Distribusi Normal

i	Ti	F(Ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	15	0.0287	-1.90	225	3.61	-28.50	-19	367
2	15	0.0697	-1.48	225	2.19	-22.20	-19	367
3	15	0.1107	-1.22	225	1.49	-18.30	-19	367
4	20	0.1516	-1.03	400	1.06	-20.60	-14	201
5	20	0.1926	-0.87	400	0.76	-17.40	-14	201
6	20	0.2336	-0.73	400	0.53	-14.60	-14	201
7	30	0.2746	-0.60	900	0.36	-18.00	-4	17
8	30	0.3156	-0.48	900	0.23	-14.40	-4	17
9	30	0.3566	-0.36	900	0.13	-10.80	-4	17
10	30	0.3975	-0.26	900	0.07	-7.80	-4	17
11	30	0.4385	-0.16	900	0.03	-4.80	-4	17
12	30	0.4795	-0.05	900	0.00	-1.50	-4	17
13	30	0.5205	0.05	900	0.00	1.50	-4	17
14	30	0.5615	0.16	900	0.03	4.80	-4	17
15	30	0.6025	0.26	900	0.07	7.80	-4	17
16	30	0.6434	0.36	900	0.13	10.80	-4	17
17	40	0.6844	0.48	1600	0.23	19.20	6	34
18	45	0.7254	0.60	2025	0.36	27.00	11	117
19	45	0.7664	0.73	2025	0.53	32.85	11	117
20	45	0.8074	0.87	2025	0.76	39.15	11	117
21	60	0.8484	1.03	3600	1.06	61.80	26	667
22	60	0.8893	1.22	3600	1.49	73.20	26	667
23	60	0.9303	1.48	3600	2.19	88.80	26	667
24	60	0.9713	1.90	3600	3.61	114.00	26	667
Total	820	12	0	32950	20.91	302	0	4933
Mean	34.17	0.50	0	1372.92	0.87	12.58	0	206

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(302) - (820)(0) = 7248 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(32950) - (820)^2 = 118400 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{7248}{\sqrt{118400 \times 501.8496}} = 0.9403$$

B. Distribusi Lognormal

i	Ti	F(ti)	Ti = LN(ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	15	0.0287	2.7081	-1.90	7.33	3.61	-5.15	-0.73	0.5388
2	15	0.0697	2.7081	-1.48	7.33	2.19	-4.01	-0.73	0.5388
3	15	0.1107	2.7081	-1.22	7.33	1.49	-3.30	-0.73	0.5388
4	20	0.1516	2.9957	-1.03	8.97	1.06	-3.09	-0.45	0.1992
5	20	0.1926	2.9957	-0.87	8.97	0.76	-2.61	-0.45	0.1992
6	20	0.2336	2.9957	-0.73	8.97	0.53	-2.19	-0.45	0.1992
7	30	0.2746	3.4012	-0.60	11.57	0.36	-2.04	-0.04	0.0017
8	30	0.3156	3.4012	-0.48	11.57	0.23	-1.63	-0.04	0.0017
9	30	0.3566	3.4012	-0.36	11.57	0.13	-1.22	-0.04	0.0017
10	30	0.3975	3.4012	-0.26	11.57	0.07	-0.88	-0.04	0.0017
11	30	0.4385	3.4012	-0.16	11.57	0.03	-0.54	-0.04	0.0017
12	30	0.4795	3.4012	-0.05	11.57	0.00	-0.17	-0.04	0.0017
13	30	0.5205	3.4012	0.05	11.57	0.00	0.17	-0.04	0.0017
14	30	0.5615	3.4012	0.16	11.57	0.03	0.54	-0.04	0.0017
15	30	0.6025	3.4012	0.26	11.57	0.07	0.88	-0.04	0.0017
16	30	0.6434	3.4012	0.36	11.57	0.13	1.22	-0.04	0.0017
17	40	0.6844	3.6889	0.48	13.61	0.23	1.77	0.25	0.0609
18	45	0.7254	3.8067	0.60	14.49	0.36	2.28	0.36	0.1329
19	45	0.7664	3.8067	0.73	14.49	0.53	2.78	0.36	0.1329
20	45	0.8074	3.8067	0.87	14.49	0.76	3.31	0.36	0.1329
21	60	0.8484	4.0943	1.03	16.76	1.06	4.22	0.65	0.4255
22	60	0.8893	4.0943	1.22	16.76	1.49	5.00	0.65	0.4255
23	60	0.9303	4.0943	1.48	16.76	2.19	6.06	0.65	0.4255
24	60	0.9713	4.0943	1.90	16.76	3.61	7.78	0.65	0.4255
Total	820	12	82.6096	0	288.73978	20.91	9.19	0	4.3923
Mean	34.17	0.50	3.4421	0	12.03	0.87	0.38	0	0.1830

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(9.19) - (82.6096)(0) = 220.497 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(288.74) - (82.6096)^2 = 105.414 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{220.497}{\sqrt{105.414 \times 501.8496}} = 0.9587$$

C. Distribusi Lognormal

I	Ti	F(Ti)	Yi = LN [1-F(Ti)]	Ti ²	Yi ²	Ti.Yi	Ti- \check{T} i	(Ti- \check{T} i) ²
1	15	0.0287	-0.0291	225	0.0008	-0.4366	-19.17	367.36
2	15	0.0697	-0.0722	225	0.0052	-1.0833	-19.17	367.36
3	15	0.1107	-0.1173	225	0.0138	-1.7591	-19.17	367.36
4	20	0.1516	-0.1644	400	0.0270	-3.2890	-14.17	200.69
5	20	0.1926	-0.2140	400	0.0458	-4.2793	-14.17	200.69
6	20	0.2336	-0.2661	400	0.0708	-5.3212	-14.17	200.69
7	30	0.2746	-0.3210	900	0.1031	-9.6306	-4.17	17.36
8	30	0.3156	-0.3792	900	0.1438	-11.3752	-4.17	17.36
9	30	0.3566	-0.4409	900	0.1944	-13.2277	-4.17	17.36
10	30	0.3975	-0.5067	900	0.2568	-15.2021	-4.17	17.36
11	30	0.4385	-0.5772	900	0.3331	-17.3156	-4.17	17.36
12	30	0.4795	-0.6530	900	0.4264	-19.5894	-4.17	17.36
13	30	0.5205	-0.7350	900	0.5402	-22.0498	-4.17	17.36
14	30	0.5615	-0.8243	900	0.6795	-24.7302	-4.17	17.36
15	30	0.6025	-0.9225	900	0.8509	-27.6737	-4.17	17.36
16	30	0.6434	-1.0313	900	1.0635	-30.9378	-4.17	17.36
17	40	0.6844	-1.1534	1600	1.3302	-46.1345	5.83	34.03
18	45	0.7254	-1.2925	2025	1.6705	-58.1614	10.83	117.36
19	45	0.7664	-1.4541	2025	2.1145	-65.4353	10.83	117.36
20	45	0.8074	-1.6470	2025	2.7127	-74.1159	10.83	117.36
21	60	0.8484	-1.8863	3600	3.5579	-113.1750	25.83	667.36
22	60	0.8893	-2.2013	3600	4.8459	-132.0799	25.83	667.36
23	60	0.9303	-2.6640	3600	7.0967	-159.8373	25.83	667.36
24	60	0.9713	-3.5513	3600	12.6114	-213.0755	25.83	667.36
Total	820	12	-23.1039	32950	40.6949	-1069.92	0	4933.33
Mean	34.17	0.50	-0.9627	1372.92	1.6956	-44.58	0	205.56

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(-1069.92) - (820)(-23.1039) = -6732.76 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(32950) - (820)^2 = 118400 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(40.6949) - (-23.1039)^2 = 442.8872 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{-6732.76}{\sqrt{118400 \times 442.8872}} = -0.9298$$

D. Distribusi Weibull

i	Ti	F(ti)	Ti = LN (ti)	Yi = LN{-LN [1-F(Ti)]}	Ti ²	Yi ²	Ti.Yi	Ti- \check{T} i	(Ti- \check{T} i) ²
1	15	0.0287	2.7081	-3.5367	7.33	12.51	-9.58	-0.7340	0.5388
2	15	0.0697	2.7081	-2.6281	7.33	6.91	-7.12	-0.7340	0.5388
3	15	0.1107	2.7081	-2.1433	7.33	4.59	-5.80	-0.7340	0.5388
4	20	0.1516	2.9957	-1.8052	8.97	3.26	-5.41	-0.4463	0.1992
5	20	0.1926	2.9957	-1.5419	8.97	2.38	-4.62	-0.4463	0.1992
6	20	0.2336	2.9957	-1.3240	8.97	1.75	-3.97	-0.4463	0.1992
7	30	0.2746	3.4012	-1.1363	11.57	1.29	-3.86	-0.0409	0.0017
8	30	0.3156	3.4012	-0.9698	11.57	0.94	-3.30	-0.0409	0.0017
9	30	0.3566	3.4012	-0.8189	11.57	0.67	-2.79	-0.0409	0.0017
10	30	0.3975	3.4012	-0.6798	11.57	0.46	-2.31	-0.0409	0.0017
11	30	0.4385	3.4012	-0.5496	11.57	0.30	-1.87	-0.0409	0.0017
12	30	0.4795	3.4012	-0.4262	11.57	0.18	-1.45	-0.0409	0.0017
13	30	0.5205	3.4012	-0.3079	11.57	0.09	-1.05	-0.0409	0.0017
14	30	0.5615	3.4012	-0.1932	11.57	0.04	-0.66	-0.0409	0.0017
15	30	0.6025	3.4012	-0.0807	11.57	0.01	-0.27	-0.0409	0.0017
16	30	0.6434	3.4012	0.0308	11.57	0.00	0.10	-0.0409	0.0017
17	40	0.6844	3.6889	0.1427	13.61	0.02	0.53	0.2468	0.0609
18	45	0.7254	3.8067	0.2566	14.49	0.07	0.98	0.3646	0.1329
19	45	0.7664	3.8067	0.3744	14.49	0.14	1.43	0.3646	0.1329
20	45	0.8074	3.8067	0.4990	14.49	0.25	1.90	0.3646	0.1329
21	60	0.8484	4.0943	0.6346	16.76	0.40	2.60	0.6523	0.4255
22	60	0.8893	4.0943	0.7891	16.76	0.62	3.23	0.6523	0.4255
23	60	0.9303	4.0943	0.9798	16.76	0.96	4.01	0.6523	0.4255
24	60	0.9713	4.0943	1.2673	16.76	1.61	5.19	0.6523	0.4255
Total	820	12	82.6096	-13.1673	288.74	39.45	-34.09	0	4.3923
Mean	34.17	0.50	3.4421	-0.5486	12.03	1.64	-1.42	0	0.1830

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(-34.09) - (82.6096)(-13.1673) = 269.6254 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(288.74) - (82.6096)^2 = 105.4142 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(39.45) - (-13.1673)^2 = 773.4767 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{4933.2}{\sqrt{59900 \times 501.8496}} = 0.9443$$

Lampiran 7
Uji Distribusi Waktu Perbaikan Komponen *Cleaning*

A. Distribusi Normal

i	Ti	F(Ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	30	0.0287	-1.90	900	3.61	-57.00	-20.42	416.84
2	30	0.0697	-1.48	900	2.19	-44.40	-20.42	416.84
3	30	0.1107	-1.22	900	1.49	-36.60	-20.42	416.84
4	30	0.1516	-1.03	900	1.06	-30.90	-20.42	416.84
5	30	0.1926	-0.87	900	0.76	-26.10	-20.42	416.84
6	30	0.2336	-0.73	900	0.53	-21.90	-20.42	416.84
7	30	0.2746	-0.60	900	0.36	-18.00	-20.42	416.84
8	30	0.3156	-0.48	900	0.23	-14.40	-20.42	416.84
9	40	0.3566	-0.36	1600	0.13	-14.40	-10.42	108.51
10	40	0.3975	-0.26	1600	0.07	-10.40	-10.42	108.51
11	40	0.4385	-0.16	1600	0.03	-6.40	-10.42	108.51
12	40	0.4795	-0.05	1600	0.00	-2.00	-10.42	108.51
13	45	0.5205	0.05	2025	0.00	2.25	-5.42	29.34
14	45	0.5615	0.16	2025	0.03	7.20	-5.42	29.34
15	60	0.6025	0.26	3600	0.07	15.60	9.58	91.84
16	60	0.6434	0.36	3600	0.13	21.60	9.58	91.84
17	60	0.6844	0.48	3600	0.23	28.80	9.58	91.84
18	60	0.7254	0.60	3600	0.36	36.00	9.58	91.84
19	60	0.7664	0.73	3600	0.53	43.80	9.58	91.84
20	60	0.8074	0.87	3600	0.76	52.20	9.58	91.84
21	90	0.8484	1.03	8100	1.06	92.70	39.58	1566.84
22	90	0.8893	1.22	8100	1.49	109.80	39.58	1566.84
23	90	0.9303	1.48	8100	2.19	133.20	39.58	1566.84
24	90	0.9713	1.90	8100	3.61	171.00	39.58	1566.84
Total	1210	12	0	71650	20.91	431.65	0	10645.83
Mean	50.42	0.50	0	2985.42	0.87	17.99	0	443.58

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(431.65) - (1210)(0) = 10359.6 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(71650) - (1210)^2 = 255500 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{10359.6}{\sqrt{255500 \times 501.8496}} = 0.9149$$

B. Distribusi Lognormal

I	ti	F(ti)	Ti = LN(ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	30	0.0287	3.4012	-1.90	11.57	3.61	-6.46	-0.4381	0.1920
2	30	0.0697	3.4012	-1.48	11.57	2.19	-5.03	-0.4381	0.1920
3	30	0.1107	3.4012	-1.22	11.57	1.49	-4.15	-0.4381	0.1920
4	30	0.1516	3.4012	-1.03	11.57	1.06	-3.50	-0.4381	0.1920
5	30	0.1926	3.4012	-0.87	11.57	0.76	-2.96	-0.4381	0.1920
6	30	0.2336	3.4012	-0.73	11.57	0.53	-2.48	-0.4381	0.1920
7	30	0.2746	3.4012	-0.60	11.57	0.36	-2.04	-0.4381	0.1920
8	30	0.3156	3.4012	-0.48	11.57	0.23	-1.63	-0.4381	0.1920
9	40	0.3566	3.6889	-0.36	13.61	0.13	-1.33	-0.1504	0.0226
10	40	0.3975	3.6889	-0.26	13.61	0.07	-0.96	-0.1504	0.0226
11	40	0.4385	3.6889	-0.16	13.61	0.03	-0.59	-0.1504	0.0226
12	40	0.4795	3.6889	-0.05	13.61	0.00	-0.18	-0.1504	0.0226
13	45	0.5205	3.8067	0.05	14.49	0.00	0.19	-0.0327	0.0011
14	45	0.5615	3.8067	0.16	14.49	0.03	0.61	-0.0327	0.0011
15	60	0.6025	4.0943	0.26	16.76	0.07	1.06	0.2550	0.0650
16	60	0.6434	4.0943	0.36	16.76	0.13	1.47	0.2550	0.0650
17	60	0.6844	4.0943	0.48	16.76	0.23	1.97	0.2550	0.0650
18	60	0.7254	4.0943	0.60	16.76	0.36	2.46	0.2550	0.0650
19	60	0.7664	4.0943	0.73	16.76	0.53	2.99	0.2550	0.0650
20	60	0.8074	4.0943	0.87	16.76	0.76	3.56	0.2550	0.0650
21	90	0.8484	4.4998	1.03	20.25	1.06	4.63	0.6605	0.4362
22	90	0.8893	4.4998	1.22	20.25	1.49	5.49	0.6605	0.4362
23	90	0.9303	4.4998	1.48	20.25	2.19	6.66	0.6605	0.4362
24	90	0.9713	4.4998	1.90	20.25	3.61	8.55	0.6605	0.4362
Total	1210	12	92.1437	0	357.53	20.91	8.32	0	3.7635
Mean	50.42	0.50	3.8393	0	14.90	0.87	0.35	0	0.1568

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(8.32) - (92.1437)(0) = 199.6547$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(357.53) - (92.1437)^2 = 90.3237$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(20.91) - (0)^2 = 501.8496$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{199.6547}{\sqrt{90.3237 \times 501.8496}} = 0.9378$$

C. Distribusi Ekspensial

I	Ti	F(Ti)	Yi = LN [1-F(Ti)]	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	30	0.0287	-0.0291	900	0.0008	-0.8732	-20.42	416.84
2	30	0.0697	-0.0722	900	0.0052	-2.1665	-20.42	416.84
3	30	0.1107	-0.1173	900	0.0138	-3.5181	-20.42	416.84
4	30	0.1516	-0.1644	900	0.0270	-4.9335	-20.42	416.84
5	30	0.1926	-0.2140	900	0.0458	-6.4189	-20.42	416.84
6	30	0.2336	-0.2661	900	0.0708	-7.9818	-20.42	416.84
7	30	0.2746	-0.3210	900	0.1031	-9.6306	-20.42	416.84
8	30	0.3156	-0.3792	900	0.1438	-11.3752	-20.42	416.84
9	40	0.3566	-0.4409	1600	0.1944	-17.6369	-10.42	108.51
10	40	0.3975	-0.5067	1600	0.2568	-20.2694	-10.42	108.51
11	40	0.4385	-0.5772	1600	0.3331	-23.0875	-10.42	108.51
12	40	0.4795	-0.6530	1600	0.4264	-26.1192	-10.42	108.51
13	45	0.5205	-0.7350	2025	0.5402	-33.0747	-5.42	29.34
14	45	0.5615	-0.8243	2025	0.6795	-37.0953	-5.42	29.34
15	60	0.6025	-0.9225	3600	0.8509	-55.3474	9.58	91.84
16	60	0.6434	-1.0313	3600	1.0635	-61.8756	9.58	91.84
17	60	0.6844	-1.1534	3600	1.3302	-69.2018	9.58	91.84
18	60	0.7254	-1.2925	3600	1.6705	-77.5485	9.58	91.84
19	60	0.7664	-1.4541	3600	2.1145	-87.2470	9.58	91.84
20	60	0.8074	-1.6470	3600	2.7127	-98.8212	9.58	91.84
21	90	0.8484	-1.8863	8100	3.5579	-169.7625	39.58	1566.84
22	90	0.8893	-2.2013	8100	4.8459	-198.1198	39.58	1566.84
23	90	0.9303	-2.6640	8100	7.0967	-239.7559	39.58	1566.84
24	90	0.9713	-3.5513	8100	12.6114	-319.6132	39.58	1566.84
Total	1210	12	-23.1039	71650	40.6949	-1581.47	0	10645.83
Mean	50.42	0.50	-0.9627	2985.42	1.6956	-65.89	0	443.58

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(-1581.47) - (1210)(-23.1039) = -9999.65 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(71650) - (1210)^2 = 255500 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(40.6949) - (-23.1039)^2 = 442.8872 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{-9999.65}{\sqrt{255500 \times 442.8872}} = -0.9400$$

D. Distribusi Weibull

i	Ti	F(ti)	Ti = LN (ti)	Yi = LN{-LN [1-F(Ti)]}	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	30	0.0287	3.4012	-3.5367	11.57	12.51	-12.03	-0.4381	0.1920
2	30	0.0697	3.4012	-2.6281	11.57	6.91	-8.94	-0.4381	0.1920
3	30	0.1107	3.4012	-2.1433	11.57	4.59	-7.29	-0.4381	0.1920
4	30	0.1516	3.4012	-1.8052	11.57	3.26	-6.14	-0.4381	0.1920
5	30	0.1926	3.4012	-1.5419	11.57	2.38	-5.24	-0.4381	0.1920
6	30	0.2336	3.4012	-1.3240	11.57	1.75	-4.50	-0.4381	0.1920
7	30	0.2746	3.4012	-1.1363	11.57	1.29	-3.86	-0.4381	0.1920
8	30	0.3156	3.4012	-0.9698	11.57	0.94	-3.30	-0.4381	0.1920
9	40	0.3566	3.6889	-0.8189	13.61	0.67	-3.02	-0.1504	0.0226
10	40	0.3975	3.6889	-0.6798	13.61	0.46	-2.51	-0.1504	0.0226
11	40	0.4385	3.6889	-0.5496	13.61	0.30	-2.03	-0.1504	0.0226
12	40	0.4795	3.6889	-0.4262	13.61	0.18	-1.57	-0.1504	0.0226
13	45	0.5205	3.8067	-0.3079	14.49	0.09	-1.17	-0.0327	0.0011
14	45	0.5615	3.8067	-0.1932	14.49	0.04	-0.74	-0.0327	0.0011
15	60	0.6025	4.0943	-0.0807	16.76	0.01	-0.33	0.2550	0.0650
16	60	0.6434	4.0943	0.0308	16.76	0.00	0.13	0.2550	0.0650
17	60	0.6844	4.0943	0.1427	16.76	0.02	0.58	0.2550	0.0650
18	60	0.7254	4.0943	0.2566	16.76	0.07	1.05	0.2550	0.0650
19	60	0.7664	4.0943	0.3744	16.76	0.14	1.53	0.2550	0.0650
20	60	0.8074	4.0943	0.4990	16.76	0.25	2.04	0.2550	0.0650
21	90	0.8484	4.4998	0.6346	20.25	0.40	2.86	0.6605	0.4362
22	90	0.8893	4.4998	0.7891	20.25	0.62	3.55	0.6605	0.4362
23	90	0.9303	4.4998	0.9798	20.25	0.96	4.41	0.6605	0.4362
24	90	0.9713	4.4998	1.2673	20.25	1.61	5.70	0.6605	0.4362
Total	1210	12	92.1437	-13.1673	357.53	39.45	-40.82	0	3.7635
Mean	50.42	0.50	3.8393	-0.5486	14.90	1.64	-1.70	0	0.1568

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(-40.82) - (92.1437)(-13.1673) = 233.6193 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(357.53) - (92.1437)^2 = 90.3234 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(39.45) - (-13.1673)^2 = 773.4767 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{233.6193}{\sqrt{90.3234 \times 773.4767}} = 0.8839$$

Lampiran 7
Uji Distribusi Waktu Perbaikan Komponen *Module Punch*

A. Distribusi Normal

I	Ti	F(Ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	60	0.0287	-1.90	3600	3.61	-114.00	-25.42	646.01
2	60	0.0697	-1.48	3600	2.19	-88.80	-25.42	646.01
3	60	0.1107	-1.22	3600	1.49	-73.20	-25.42	646.01
4	60	0.1516	-1.03	3600	1.06	-61.80	-25.42	646.01
5	60	0.1926	-0.87	3600	0.76	-52.20	-25.42	646.01
6	60	0.2336	-0.73	3600	0.53	-43.80	-25.42	646.01
7	60	0.2746	-0.60	3600	0.36	-36.00	-25.42	646.01
8	75	0.3156	-0.48	5625	0.23	-36.00	-10.42	108.51
9	75	0.3566	-0.36	5625	0.13	-27.00	-10.42	108.51
10	80	0.3975	-0.26	6400	0.07	-20.80	-5.42	29.34
11	80	0.4385	-0.16	6400	0.03	-12.80	-5.42	29.34
12	90	0.4795	-0.05	8100	0.00	-4.50	4.58	21.01
13	90	0.5205	0.05	8100	0.00	4.50	4.58	21.01
14	90	0.5615	0.16	8100	0.03	14.40	4.58	21.01
15	90	0.6025	0.26	8100	0.07	23.40	4.58	21.01
16	90	0.6434	0.36	8100	0.13	32.40	4.58	21.01
17	90	0.6844	0.48	8100	0.23	43.20	4.58	21.01
18	90	0.7254	0.60	8100	0.36	54.00	4.58	21.01
19	90	0.7664	0.73	8100	0.53	65.70	4.58	21.01
20	120	0.8074	0.87	14400	0.76	104.40	34.58	1196.01
21	120	0.8484	1.03	14400	1.06	123.60	34.58	1196.01
22	120	0.8893	1.22	14400	1.49	146.40	34.58	1196.01
23	120	0.9303	1.48	14400	2.19	177.60	34.58	1196.01
24	120	0.9713	1.90	14400	3.61	228.00	34.58	1196.01
Total	2050	12	0	186050	20.91	446.70	0	10945.8333
Mean	85.42	0.50	0	7752.08	0.87	18.61	0	456.08

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(446.70) - (2050)(0) = 10720.8 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(186050) - (2050)^2 = 262700 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{10720.8}{\sqrt{262700 \times 501.8496}} = 0.9337$$

B. Distribusi Lognormal

i	ti	F(ti)	Ti = LN(ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	60	0.0287	4.0943	-1.90	16.76	3.61	-7.78	-0.3221	0.1038
2	60	0.0697	4.0943	-1.48	16.76	2.19	-6.06	-0.3221	0.1038
3	60	0.1107	4.0943	-1.22	16.76	1.49	-5.00	-0.3221	0.1038
4	60	0.1516	4.0943	-1.03	16.76	1.06	-4.22	-0.3221	0.1038
5	60	0.1926	4.0943	-0.87	16.76	0.76	-3.56	-0.3221	0.1038
6	60	0.2336	4.0943	-0.73	16.76	0.53	-2.99	-0.3221	0.1038
7	60	0.2746	4.0943	-0.60	16.76	0.36	-2.46	-0.3221	0.1038
8	75	0.3156	4.3175	-0.48	18.64	0.23	-2.07	-0.0990	0.0098
9	75	0.3566	4.3175	-0.36	18.64	0.13	-1.55	-0.0990	0.0098
10	80	0.3975	4.3820	-0.26	19.20	0.07	-1.14	-0.0344	0.0012
11	80	0.4385	4.3820	-0.16	19.20	0.03	-0.70	-0.0344	0.0012
12	90	0.4795	4.4998	-0.05	20.25	0.00	-0.22	0.0833	0.0069
13	90	0.5205	4.4998	0.05	20.25	0.00	0.22	0.0833	0.0069
14	90	0.5615	4.4998	0.16	20.25	0.03	0.72	0.0833	0.0069
15	90	0.6025	4.4998	0.26	20.25	0.07	1.17	0.0833	0.0069
16	90	0.6434	4.4998	0.36	20.25	0.13	1.62	0.0833	0.0069
17	90	0.6844	4.4998	0.48	20.25	0.23	2.16	0.0833	0.0069
18	90	0.7254	4.4998	0.60	20.25	0.36	2.70	0.0833	0.0069
19	90	0.7664	4.4998	0.73	20.25	0.53	3.28	0.0833	0.0069
20	120	0.8074	4.7875	0.87	22.92	0.76	4.17	0.3710	0.1377
21	120	0.8484	4.7875	1.03	22.92	1.06	4.93	0.3710	0.1377
22	120	0.8893	4.7875	1.22	22.92	1.49	5.84	0.3710	0.1377
23	120	0.9303	4.7875	1.48	22.92	2.19	7.09	0.3710	0.1377
24	120	0.9713	4.7875	1.90	22.92	3.61	9.10	0.3710	0.1377
Total	2050	12	105.9954	0	469.62	20.91	5.25	0	1.4922
Mean	85.42	0.50	4.4165	0	19.57	0.87	0.22	0	0.0622

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(5.25) - (2050)(0) = 125.9363$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(469.62) - (2050)^2 = 35.8121$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(20.91) - (0)^2 = 501.8496$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{125.9363}{\sqrt{35.8121 \times 501.8496}} = 0.9394$$

C. Distribusi Eksponensial

I	Ti	F(Ti)	Yi = LN [1-F(Ti)]	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	60	0.0287	-0.0291	3600	0.0008	-1.7465	-25.42	646.01
2	60	0.0697	-0.0722	3600	0.0052	-4.3331	-25.42	646.01
3	60	0.1107	-0.1173	3600	0.0138	-7.0363	-25.42	646.01
4	60	0.1516	-0.1644	3600	0.0270	-9.8670	-25.42	646.01
5	60	0.1926	-0.2140	3600	0.0458	-12.8379	-25.42	646.01
6	60	0.2336	-0.2661	3600	0.0708	-15.9636	-25.42	646.01
7	60	0.2746	-0.3210	3600	0.1031	-19.2611	-25.42	646.01
8	75	0.3156	-0.3792	5625	0.1438	-28.4381	-10.42	108.51
9	75	0.3566	-0.4409	5625	0.1944	-33.0692	-10.42	108.51
10	80	0.3975	-0.5067	6400	0.2568	-40.5389	-5.42	29.34
11	80	0.4385	-0.5772	6400	0.3331	-46.1750	-5.42	29.34
12	90	0.4795	-0.6530	8100	0.4264	-58.7683	4.58	21.01
13	90	0.5205	-0.7350	8100	0.5402	-66.1495	4.58	21.01
14	90	0.5615	-0.8243	8100	0.6795	-74.1905	4.58	21.01
15	90	0.6025	-0.9225	8100	0.8509	-83.0212	4.58	21.01
16	90	0.6434	-1.0313	8100	1.0635	-92.8134	4.58	21.01
17	90	0.6844	-1.1534	8100	1.3302	-103.8027	4.58	21.01
18	90	0.7254	-1.2925	8100	1.6705	-116.3228	4.58	21.01
19	90	0.7664	-1.4541	8100	2.1145	-130.8705	4.58	21.01
20	120	0.8074	-1.6470	14400	2.7127	-197.6425	34.58	1196.01
21	120	0.8484	-1.8863	14400	3.5579	-226.3500	34.58	1196.01
22	120	0.8893	-2.2013	14400	4.8459	-264.1598	34.58	1196.01
23	120	0.9303	-2.6640	14400	7.0967	-319.6746	34.58	1196.01
24	120	0.9713	-3.5513	14400	12.6114	-426.1510	34.58	1196.01
Total	2050	12	-23.1039	186050	40.69491	-2379.18	0	10945.83
Mean	85.42	0.50	-0.9627	7752.08	1.6956	-99.13	0	456.08

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(-2379.18) - (2050)(-23.1039) = -9737.38 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(186050) - (2050)^2 = 262700 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(40.69491) - (-23.1039)^2 = 442.8872 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{4933.2}{\sqrt{59900 \times 501.8496}} = -0.9028$$

D. Distribusi Weibull

i	Ti	F(ti)	Ti = LN (ti)	Yi = LN{-LN [1-F(Ti)]}	Ti ²	Yi ²	Ti.Yi	Ti- \check{T} i	(Ti- \check{T} i) ²
1	60	0.0287	4.0943	-3.5367	16.76	12.51	-14.48	-0.3221	0.1038
2	60	0.0697	4.0943	-2.6281	16.76	6.91	-10.76	-0.3221	0.1038
3	60	0.1107	4.0943	-2.1433	16.76	4.59	-8.78	-0.3221	0.1038
4	60	0.1516	4.0943	-1.8052	16.76	3.26	-7.39	-0.3221	0.1038
5	60	0.1926	4.0943	-1.5419	16.76	2.38	-6.31	-0.3221	0.1038
6	60	0.2336	4.0943	-1.3240	16.76	1.75	-5.42	-0.3221	0.1038
7	60	0.2746	4.0943	-1.1363	16.76	1.29	-4.65	-0.3221	0.1038
8	75	0.3156	4.3175	-0.9698	18.64	0.94	-4.19	-0.0990	0.0098
9	75	0.3566	4.3175	-0.8189	18.64	0.67	-3.54	-0.0990	0.0098
10	80	0.3975	4.3820	-0.6798	19.20	0.46	-2.98	-0.0344	0.0012
11	80	0.4385	4.3820	-0.5496	19.20	0.30	-2.41	-0.0344	0.0012
12	90	0.4795	4.4998	-0.4262	20.25	0.18	-1.92	0.0833	0.0069
13	90	0.5205	4.4998	-0.3079	20.25	0.09	-1.39	0.0833	0.0069
14	90	0.5615	4.4998	-0.1932	20.25	0.04	-0.87	0.0833	0.0069
15	90	0.6025	4.4998	-0.0807	20.25	0.01	-0.36	0.0833	0.0069
16	90	0.6434	4.4998	0.0308	20.25	0.00	0.14	0.0833	0.0069
17	90	0.6844	4.4998	0.1427	20.25	0.02	0.64	0.0833	0.0069
18	90	0.7254	4.4998	0.2566	20.25	0.07	1.15	0.0833	0.0069
19	90	0.7664	4.4998	0.3744	20.25	0.14	1.68	0.0833	0.0069
20	120	0.8074	4.7875	0.4990	22.92	0.25	2.39	0.3710	0.1377
21	120	0.8484	4.7875	0.6346	22.92	0.40	3.04	0.3710	0.1377
22	120	0.8893	4.7875	0.7891	22.92	0.62	3.78	0.3710	0.1377
23	120	0.9303	4.7875	0.9798	22.92	0.96	4.69	0.3710	0.1377
24	120	0.9713	4.7875	1.2673	22.92	1.61	6.07	0.3710	0.1377
Total	2050	12	105.9954	-13.1673	469.62	39.45	-51.86	0	1.4922
Mean	85.42	0.50	4.4165	-0.5486	19.57	1.64	-2.16	0	0.0622

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i) (\sum_{i=1}^n Y_i) \\ = 24 (-51.86) - (105.9954)(-13.1673) = 151.1157$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24 (469.62) - (105.9954)^2 = 35.8121$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24 (39.45) - (-13.1673)^2 = 773.4767$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}} = \frac{151.1157}{\sqrt{35.8121 \times 773.4767}} = 0.9080$$

Lampiran 7
Uji Distribusi Waktu Perbaikan Komponen Tacking

A. Distribusi Normal

I	Ti	F(Ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	15	0.0287	-1.90	225	3.61	-28.50	-20.21	408.38
2	15	0.0697	-1.48	225	2.19	-22.20	-20.21	408.38
3	15	0.1107	-1.22	225	1.49	-18.30	-20.21	408.38
4	20	0.1516	-1.03	400	1.06	-20.60	-15.21	231.29
5	20	0.1926	-0.87	400	0.76	-17.40	-15.21	231.29
6	20	0.2336	-0.73	400	0.53	-14.60	-15.21	231.29
7	30	0.2746	-0.60	900	0.36	-18.00	-5.21	27.13
8	30	0.3156	-0.48	900	0.23	-14.40	-5.21	27.13
9	30	0.3566	-0.36	900	0.13	-10.80	-5.21	27.13
10	30	0.3975	-0.26	900	0.07	-7.80	-5.21	27.13
11	30	0.4385	-0.16	900	0.03	-4.80	-5.21	27.13
12	30	0.4795	-0.05	900	0.00	-1.50	-5.21	27.13
13	30	0.5205	0.05	900	0.00	1.50	-5.21	27.13
14	30	0.5615	0.16	900	0.03	4.80	-5.21	27.13
15	30	0.6025	0.26	900	0.07	7.80	-5.21	27.13
16	35	0.6434	0.36	1225	0.13	12.60	-0.21	0.04
17	45	0.6844	0.48	2025	0.23	21.60	9.79	95.88
18	45	0.7254	0.60	2025	0.36	27.00	9.79	95.88
19	45	0.7664	0.73	2025	0.53	32.85	9.79	95.88
20	60	0.8074	0.87	3600	0.76	52.20	24.79	614.63
21	60	0.8484	1.03	3600	1.06	61.80	24.79	614.63
22	60	0.8893	1.22	3600	1.49	73.20	24.79	614.63
23	60	0.9303	1.48	3600	2.19	88.80	24.79	614.63
24	60	0.9713	1.90	3600	3.61	114.00	24.79	614.63
Total	845	12	0	35275	20.91	319.25	0	5523.96
Mean	35.21	0.50	0	1469.79	0.87	13.30	0	230.16

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(319.25) - (845)(0) = 7662 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(35275) - (845)^2 = 132575 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{7662}{\sqrt{132575 \times 501.8496}} = 0.9393$$

B. Distribusi Lognormal

I	ti	F(ti)	Ti = LN(ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	15	0.0287	2.7081	-1.90	7.33	3.61	-5.15	-0.7573	0.5736
2	15	0.0697	2.7081	-1.48	7.33	2.19	-4.01	-0.7573	0.5736
3	15	0.1107	2.7081	-1.22	7.33	1.49	-3.30	-0.7573	0.5736
4	20	0.1516	2.9957	-1.03	8.97	1.06	-3.09	-0.4697	0.2206
5	20	0.1926	2.9957	-0.87	8.97	0.76	-2.61	-0.4697	0.2206
6	20	0.2336	2.9957	-0.73	8.97	0.53	-2.19	-0.4697	0.2206
7	30	0.2746	3.4012	-0.60	11.57	0.36	-2.04	-0.0642	0.0041
8	30	0.3156	3.4012	-0.48	11.57	0.23	-1.63	-0.0642	0.0041
9	30	0.3566	3.4012	-0.36	11.57	0.13	-1.22	-0.0642	0.0041
10	30	0.3975	3.4012	-0.26	11.57	0.07	-0.88	-0.0642	0.0041
11	30	0.4385	3.4012	-0.16	11.57	0.03	-0.54	-0.0642	0.0041
12	30	0.4795	3.4012	-0.05	11.57	0.00	-0.17	-0.0642	0.0041
13	30	0.5205	3.4012	0.05	11.57	0.00	0.17	-0.0642	0.0041
14	30	0.5615	3.4012	0.16	11.57	0.03	0.54	-0.0642	0.0041
15	30	0.6025	3.4012	0.26	11.57	0.07	0.88	-0.0642	0.0041
16	35	0.6434	3.5553	0.36	12.64	0.13	1.28	0.0900	0.0081
17	45	0.6844	3.8067	0.48	14.49	0.23	1.83	0.3413	0.1165
18	45	0.7254	3.8067	0.60	14.49	0.36	2.28	0.3413	0.1165
19	45	0.7664	3.8067	0.73	14.49	0.53	2.78	0.3413	0.1165
20	60	0.8074	4.0943	0.87	16.76	0.76	3.56	0.6290	0.3956
21	60	0.8484	4.0943	1.03	16.76	1.06	4.22	0.6290	0.3956
22	60	0.8893	4.0943	1.22	16.76	1.49	5.00	0.6290	0.3956
23	60	0.9303	4.0943	1.48	16.76	2.19	6.06	0.6290	0.3956
24	60	0.9713	4.0943	1.90	16.76	3.61	7.78	0.6290	0.3956
Total	845	12	83.1692	0	292.97	20.91	9.55	0	4.7549
Mean	35.21	0.50	3.4654	0	12.21	0.87	0.40	0	0.1981

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(9.55) - (845)(0) = 229.1926$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(292.97) - (845)^2 = 114.1182$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(20.91) - (0)^2 = 501.8496$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{229.1926}{\sqrt{114.1182 \times 501.8496}} = 0.9577$$

C. Distribusi Eksponensial

i	Ti	F(Ti)	Yi = LN [1-F(Ti)]	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	15	0.0287	-0.0291	225	0.0008	-0.4366	-20.21	408.38
2	15	0.0697	-0.0722	225	0.0052	-1.0833	-20.21	408.38
3	15	0.1107	-0.1173	225	0.0138	-1.7591	-20.21	408.38
4	20	0.1516	-0.1644	400	0.0270	-3.2890	-15.21	231.29
5	20	0.1926	-0.2140	400	0.0458	-4.2793	-15.21	231.29
6	20	0.2336	-0.2661	400	0.0708	-5.3212	-15.21	231.29
7	30	0.2746	-0.3210	900	0.1031	-9.6306	-5.21	27.13
8	30	0.3156	-0.3792	900	0.1438	-11.3752	-5.21	27.13
9	30	0.3566	-0.4409	900	0.1944	-13.2277	-5.21	27.13
10	30	0.3975	-0.5067	900	0.2568	-15.2021	-5.21	27.13
11	30	0.4385	-0.5772	900	0.3331	-17.3156	-5.21	27.13
12	30	0.4795	-0.6530	900	0.4264	-19.5894	-5.21	27.13
13	30	0.5205	-0.7350	900	0.5402	-22.0498	-5.21	27.13
14	30	0.5615	-0.8243	900	0.6795	-24.7302	-5.21	27.13
15	30	0.6025	-0.9225	900	0.8509	-27.6737	-5.21	27.13
16	35	0.6434	-1.0313	1225	1.0635	-36.0941	-0.21	0.04
17	45	0.6844	-1.1534	2025	1.3302	-51.9013	9.79	95.88
18	45	0.7254	-1.2925	2025	1.6705	-58.1614	9.79	95.88
19	45	0.7664	-1.4541	2025	2.1145	-65.4353	9.79	95.88
20	60	0.8074	-1.6470	3600	2.7127	-98.8212	24.79	614.63
21	60	0.8484	-1.8863	3600	3.5579	-113.1750	24.79	614.63
22	60	0.8893	-2.2013	3600	4.8459	-132.0799	24.79	614.63
23	60	0.9303	-2.6640	3600	7.0967	-159.8373	24.79	614.63
24	60	0.9713	-3.5513	3600	12.6114	-213.0755	24.79	614.63
Total	845	12	-23.1039	35275	40.6949	-1105.54	0	5523.96
Mean	35.21	0.50	-0.9627	1469.79	1.6956	-46.06	0	230.16

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(-1105.54) - (845)(-23.1039) = -7010.24 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(35275) - (845)^2 = 132575 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(40.6949) - (-23.1039)^2 = 442.8872 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{-7010.24}{\sqrt{132575 \times 442.8872}} = -0.9149$$

D. Distribusi Weibull

i	Ti	F(ti)	Ti = LN (ti)	Yi = LN{-LN [1-F(Ti)]}	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	15	0.0287	2.7081	-3.5367	7.33	12.51	-9.58	-0.7573	0.5736
2	15	0.0697	2.7081	-2.6281	7.33	6.91	-7.12	-0.7573	0.5736
3	15	0.1107	2.7081	-2.1433	7.33	4.59	-5.80	-0.7573	0.5736
4	20	0.1516	2.9957	-1.8052	8.97	3.26	-5.41	-0.4697	0.2206
5	20	0.1926	2.9957	-1.5419	8.97	2.38	-4.62	-0.4697	0.2206
6	20	0.2336	2.9957	-1.3240	8.97	1.75	-3.97	-0.4697	0.2206
7	30	0.2746	3.4012	-1.1363	11.57	1.29	-3.86	-0.0642	0.0041
8	30	0.3156	3.4012	-0.9698	11.57	0.94	-3.30	-0.0642	0.0041
9	30	0.3566	3.4012	-0.8189	11.57	0.67	-2.79	-0.0642	0.0041
10	30	0.3975	3.4012	-0.6798	11.57	0.46	-2.31	-0.0642	0.0041
11	30	0.4385	3.4012	-0.5496	11.57	0.30	-1.87	-0.0642	0.0041
12	30	0.4795	3.4012	-0.4262	11.57	0.18	-1.45	-0.0642	0.0041
13	30	0.5205	3.4012	-0.3079	11.57	0.09	-1.05	-0.0642	0.0041
14	30	0.5615	3.4012	-0.1932	11.57	0.04	-0.66	-0.0642	0.0041
15	30	0.6025	3.4012	-0.0807	11.57	0.01	-0.27	-0.0642	0.0041
16	35	0.6434	3.5553	0.0308	12.64	0.00	0.11	0.0900	0.0081
17	45	0.6844	3.8067	0.1427	14.49	0.02	0.54	0.3413	0.1165
18	45	0.7254	3.8067	0.2566	14.49	0.07	0.98	0.3413	0.1165
19	45	0.7664	3.8067	0.3744	14.49	0.14	1.43	0.3413	0.1165
20	60	0.8074	4.0943	0.4990	16.76	0.25	2.04	0.6290	0.3956
21	60	0.8484	4.0943	0.6346	16.76	0.40	2.60	0.6290	0.3956
22	60	0.8893	4.0943	0.7891	16.76	0.62	3.23	0.6290	0.3956
23	60	0.9303	4.0943	0.9798	16.76	0.96	4.01	0.6290	0.3956
24	60	0.9713	4.0943	1.2673	16.76	1.61	5.19	0.6290	0.3956
Total	845	12	83.1692	-13.1673	292.97	39.45	-33.92	0	4.7549
Mean	35.21	0.50	3.4654	-0.5486	12.21	1.64	-1.41	0	0.1981

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(-33.92) - (83.1692)(-13.1673) = 280.9563$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(292.97) - (83.1692)^2 = 114.1182$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(39.45) - (-13.1673)^2 = 773.4767$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{280.9563}{\sqrt{114.1182 \times 773.4767}} = 0.9457$$

Lampiran 7
Uji Distribusi Waktu Perbaikan Komponen *Welding*

A. Distribusi Normal

i	Ti	F(Ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T}_i	(Ti- \bar{T}_i) ²
1	30	0.0287	-1.90	900	3.61	-57.00	-27.50	756.25
2	30	0.0697	-1.48	900	2.19	-44.40	-27.50	756.25
3	30	0.1107	-1.22	900	1.49	-36.60	-27.50	756.25
4	30	0.1516	-1.03	900	1.06	-30.90	-27.50	756.25
5	30	0.1926	-0.87	900	0.76	-26.10	-27.50	756.25
6	30	0.2336	-0.73	900	0.53	-21.90	-27.50	756.25
7	40	0.2746	-0.60	1600	0.36	-24.00	-17.50	306.25
8	45	0.3156	-0.48	2025	0.23	-21.60	-12.50	156.25
9	45	0.3566	-0.36	2025	0.13	-16.20	-12.50	156.25
10	50	0.3975	-0.26	2500	0.07	-13.00	-7.50	56.25
11	60	0.4385	-0.16	3600	0.03	-9.60	2.50	6.25
12	60	0.4795	-0.05	3600	0.00	-3.00	2.50	6.25
13	60	0.5205	0.05	3600	0.00	3.00	2.50	6.25
14	60	0.5615	0.16	3600	0.03	9.60	2.50	6.25
15	60	0.6025	0.26	3600	0.07	15.60	2.50	6.25
16	60	0.6434	0.36	3600	0.13	21.60	2.50	6.25
17	60	0.6844	0.48	3600	0.23	28.80	2.50	6.25
18	60	0.7254	0.60	3600	0.36	36.00	2.50	6.25
19	90	0.7664	0.73	8100	0.53	65.70	32.50	1056.25
20	90	0.8074	0.87	8100	0.76	78.30	32.50	1056.25
21	90	0.8484	1.03	8100	1.06	92.70	32.50	1056.25
22	90	0.8893	1.22	8100	1.49	109.80	32.50	1056.25
23	90	0.9303	1.48	8100	2.19	133.20	32.50	1056.25
24	90	0.9713	1.90	8100	3.61	171.00	32.50	1056.25
Total	1380	12	0	90950	20.91	461	0	11600
Mean	57.50	0.50	0	3789.58	0.87	19.21	0	483.33

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(461) - (1380)(0) = 11064 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(90950) - (1380)^2 = 278400 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(20.91) - (0)^2 = 501.8496 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{11064}{\sqrt{278400 \times 501.8496}} = 0.9360$$

B. Distribusi Lognormal

i	ti	F(ti)	Ti = LN(ti)	Yi	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	30	0.0287	3.4012	-1.90	11.57	3.61	-6.46	-0.5728	0.3281
2	30	0.0697	3.4012	-1.48	11.57	2.19	-5.03	-0.5728	0.3281
3	30	0.1107	3.4012	-1.22	11.57	1.49	-4.15	-0.5728	0.3281
4	30	0.1516	3.4012	-1.03	11.57	1.06	-3.50	-0.5728	0.3281
5	30	0.1926	3.4012	-0.87	11.57	0.76	-2.96	-0.5728	0.3281
6	30	0.2336	3.4012	-0.73	11.57	0.53	-2.48	-0.5728	0.3281
7	40	0.2746	3.6889	-0.60	13.61	0.36	-2.21	-0.2851	0.0813
8	45	0.3156	3.8067	-0.48	14.49	0.23	-1.83	-0.1673	0.0280
9	45	0.3566	3.8067	-0.36	14.49	0.13	-1.37	-0.1673	0.0280
10	50	0.3975	3.9120	-0.26	15.30	0.07	-1.02	-0.0619	0.0038
11	60	0.4385	4.0943	-0.16	16.76	0.03	-0.66	0.1204	0.0145
12	60	0.4795	4.0943	-0.05	16.76	0.00	-0.20	0.1204	0.0145
13	60	0.5205	4.0943	0.05	16.76	0.00	0.20	0.1204	0.0145
14	60	0.5615	4.0943	0.16	16.76	0.03	0.66	0.1204	0.0145
15	60	0.6025	4.0943	0.26	16.76	0.07	1.06	0.1204	0.0145
16	60	0.6434	4.0943	0.36	16.76	0.13	1.47	0.1204	0.0145
17	60	0.6844	4.0943	0.48	16.76	0.23	1.97	0.1204	0.0145
18	60	0.7254	4.0943	0.60	16.76	0.36	2.46	0.1204	0.0145
19	90	0.7664	4.4998	0.73	20.25	0.53	3.28	0.5259	0.2765
20	90	0.8074	4.4998	0.87	20.25	0.76	3.91	0.5259	0.2765
21	90	0.8484	4.4998	1.03	20.25	1.06	4.63	0.5259	0.2765
22	90	0.8893	4.4998	1.22	20.25	1.49	5.49	0.5259	0.2765
23	90	0.9303	4.4998	1.48	20.25	2.19	6.66	0.5259	0.2765
24	90	0.9713	4.4998	1.90	20.25	3.61	8.55	0.5259	0.2765
Total	1380	12	95.3750	0	382.90	20.91	8.48	0	3.8845
Mean	57.50	0.50	3.9740	0	15.95	0.87	0.35	0	0.1619

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(8.48) - (95.3750)(0) = 203.4073$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(382.90) - (95.3750)^2 = 93.2274$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(20.91) - (0)^2 = 501.8496$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{203.4073}{\sqrt{93.2274 \times 501.8496}} = 0.9404$$

C. Distribusi Eksponensial

I	Ti	F(Ti)	Yi = LN [1-F(Ti)]	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	30	0.0287	-0.0291	900	0.0008	-0.8732	-27.50	756.25
2	30	0.0697	-0.0722	900	0.0052	-2.1665	-27.50	756.25
3	30	0.1107	-0.1173	900	0.0138	-3.5181	-27.50	756.25
4	30	0.1516	-0.1644	900	0.0270	-4.9335	-27.50	756.25
5	30	0.1926	-0.2140	900	0.0458	-6.4189	-27.50	756.25
6	30	0.2336	-0.2661	900	0.0708	-7.9818	-27.50	756.25
7	40	0.2746	-0.3210	1600	0.1031	-12.8407	-17.50	306.25
8	45	0.3156	-0.3792	2025	0.1438	-17.0628	-12.50	156.25
9	45	0.3566	-0.4409	2025	0.1944	-19.8415	-12.50	156.25
10	50	0.3975	-0.5067	2500	0.2568	-25.3368	-7.50	56.25
11	60	0.4385	-0.5772	3600	0.3331	-34.6312	2.50	6.25
12	60	0.4795	-0.6530	3600	0.4264	-39.1789	2.50	6.25
13	60	0.5205	-0.7350	3600	0.5402	-44.0997	2.50	6.25
14	60	0.5615	-0.8243	3600	0.6795	-49.4604	2.50	6.25
15	60	0.6025	-0.9225	3600	0.8509	-55.3474	2.50	6.25
16	60	0.6434	-1.0313	3600	1.0635	-61.8756	2.50	6.25
17	60	0.6844	-1.1534	3600	1.3302	-69.2018	2.50	6.25
18	60	0.7254	-1.2925	3600	1.6705	-77.5485	2.50	6.25
19	90	0.7664	-1.4541	8100	2.1145	-130.8705	32.50	1056.25
20	90	0.8074	-1.6470	8100	2.7127	-148.2319	32.50	1056.25
21	90	0.8484	-1.8863	8100	3.5579	-169.7625	32.50	1056.25
22	90	0.8893	-2.2013	8100	4.8459	-198.1198	32.50	1056.25
23	90	0.9303	-2.6640	8100	7.0967	-239.7559	32.50	1056.25
24	90	0.9713	-3.5513	8100	12.6114	-319.6132	32.50	1056.25
Total	1380	12	-23.1039	90950	40.6949	-1738.67	0	11600
Mean	57.50	0.50	-0.9627	3789.58	1.6956	-72.44	0	483.33

Index of Fit

$$\begin{aligned} \text{a) } S_{xy} &= N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ &= 24(-1738.67) - (1380)(-23.1039) = -9844.71 \end{aligned}$$

$$\begin{aligned} \text{b) } S_{xx} &= N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ &= 24(90950) - (1380)^2 = 278400 \end{aligned}$$

$$\begin{aligned} \text{c) } S_{yy} &= N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ &= 24(40.6949) - (-23.1039)^2 = 442.8872 \end{aligned}$$

$$\text{d) } r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{-9844.71}{\sqrt{278400 \times 442.8872}} = -0.8866$$

D. Distribusi Weibull

i	ti	F(ti)	Ti = LN (ti)	Yi = LN{-LN [1-F(Ti)]}	Ti ²	Yi ²	Ti.Yi	Ti- \bar{T} i	(Ti- \bar{T} i) ²
1	15	0.0287	2.7081	-3.5367	7.33	12.51	-9.58	-0.7573	0.5736
2	15	0.0697	2.7081	-2.6281	7.33	6.91	-7.12	-0.7573	0.5736
3	15	0.1107	2.7081	-2.1433	7.33	4.59	-5.80	-0.7573	0.5736
4	20	0.1516	2.9957	-1.8052	8.97	3.26	-5.41	-0.4697	0.2206
5	20	0.1926	2.9957	-1.5419	8.97	2.38	-4.62	-0.4697	0.2206
6	20	0.2336	2.9957	-1.3240	8.97	1.75	-3.97	-0.4697	0.2206
7	30	0.2746	3.4012	-1.1363	11.57	1.29	-3.86	-0.0642	0.0041
8	30	0.3156	3.4012	-0.9698	11.57	0.94	-3.30	-0.0642	0.0041
9	30	0.3566	3.4012	-0.8189	11.57	0.67	-2.79	-0.0642	0.0041
10	30	0.3975	3.4012	-0.6798	11.57	0.46	-2.31	-0.0642	0.0041
11	30	0.4385	3.4012	-0.5496	11.57	0.30	-1.87	-0.0642	0.0041
12	30	0.4795	3.4012	-0.4262	11.57	0.18	-1.45	-0.0642	0.0041
13	30	0.5205	3.4012	-0.3079	11.57	0.09	-1.05	-0.0642	0.0041
14	30	0.5615	3.4012	-0.1932	11.57	0.04	-0.66	-0.0642	0.0041
15	30	0.6025	3.4012	-0.0807	11.57	0.01	-0.27	-0.0642	0.0041
16	35	0.6434	3.5553	0.0308	12.64	0.00	0.11	0.0900	0.0081
17	45	0.6844	3.8067	0.1427	14.49	0.02	0.54	0.3413	0.1165
18	45	0.7254	3.8067	0.2566	14.49	0.07	0.98	0.3413	0.1165
19	45	0.7664	3.8067	0.3744	14.49	0.14	1.43	0.3413	0.1165
20	60	0.8074	4.0943	0.4990	16.76	0.25	2.04	0.6290	0.3956
21	60	0.8484	4.0943	0.6346	16.76	0.40	2.60	0.6290	0.3956
22	60	0.8893	4.0943	0.7891	16.76	0.62	3.23	0.6290	0.3956
23	60	0.9303	4.0943	0.9798	16.76	0.96	4.01	0.6290	0.3956
24	60	0.9713	4.0943	1.2673	16.76	1.61	5.19	0.6290	0.3956
Total	845	12	83.1692	-13.1673	292.97	39.45	-33.92	0	4.7549
Mean	35.21	0.50	3.4654	-0.5486	12.21	1.64	-1.41	0	0.1981

Index of Fit

$$a) S_{xy} = N(\sum_{i=1}^n T_i Y_i) - (\sum_{i=1}^n T_i)(\sum_{i=1}^n Y_i) \\ = 24(-33.92) - (83.1692)(-13.1673) = 248.4732$$

$$b) S_{xx} = N(\sum_{i=1}^n T_i^2) - (\sum_{i=1}^n T_i)^2 \\ = 24(292.97) - (83.1692)^2 = 93.2274$$

$$c) S_{yy} = N(\sum_{i=1}^n Y_i^2) - (\sum_{i=1}^n Y_i)^2 \\ = 24(39.45) - (-13.1673)^2 = 773.4767$$

$$d) r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{248.4732}{\sqrt{93.2274 \times 773.4767}} = 0.9253$$

Lampiran 8
Summary Index of Fit Uji Distribusi Waktu Kerusakan Komponen

<i>Summary Index of Fit CID</i>		
1. <i>Index of Fit</i> untuk Distribusi Normal:		0.9774
2. <i>Index of Fit</i> untuk Distribusi Lognormal:		0.9753
3. <i>Index of Fit</i> untuk Distribusi Eksponensial:		-0.8644
4. <i>Index of Fit</i> untuk Distribusi Weibull:		0.9816
Distribusi Terpilih:	Weibull	0.9816

<i>Summary Index of Fit Cleaning</i>		
1. <i>Index of Fit</i> untuk Distribusi Normal:		0.9853
2. <i>Index of Fit</i> untuk Distribusi Lognormal:		0.9853
3. <i>Index of Fit</i> untuk Distribusi Eksponensial:		-0.9299
4. <i>Index of Fit</i> untuk Distribusi Weibull:		0.9671
Distribusi Terpilih:	Normal	0.9853

<i>Summary Index of Fit Module Punch</i>		
1. <i>Index of Fit</i> untuk Distribusi Normal:		0.9855
2. <i>Index of Fit</i> untuk Distribusi Lognormal:		0.9845
3. <i>Index of Fit</i> untuk Distribusi Eksponensial:		-0.8847
4. <i>Index of Fit</i> untuk Distribusi Weibull:		0.9826
Distribusi Terpilih:	Normal	0.9855

<i>Summary Index of Fit Tacking</i>		
1. <i>Index of Fit</i> untuk Distribusi Normal:		0.9885
2. <i>Index of Fit</i> untuk Distribusi Lognormal:		0.9847
3. <i>Index of Fit</i> untuk Distribusi Eksponensial:		-0.8887
4. <i>Index of Fit</i> untuk Distribusi Weibull:		0.9891
Distribusi Terpilih:	Weibull	0.9891

<i>Summary Index of Fit Welding</i>		
1. <i>Index of Fit</i> untuk Distribusi Normal:		0.9773
2. <i>Index of Fit</i> untuk Distribusi Lognormal:		0.9792
3. <i>Index of Fit</i> untuk Distribusi Eksponensial:		-0.9504
4. <i>Index of Fit</i> untuk Distribusi Weibull:		0.9451
Distribusi Terpilih:	Lognormal	0.9792

Lampiran 9

Summary Index of Fit Uji Distribusi Waktu Perbaikan Komponen

<i>Summary Index of Fit CID</i>		
1. <i>Index of Fit</i> untuk Distribusi Normal:		0.9403
2. <i>Index of Fit</i> untuk Distribusi Lognormal:		0.9587
3. <i>Index of Fit</i> untuk Distribusi Eksponensial:		-0.9298
4. <i>Index of Fit</i> untuk Distribusi Weibull:		0.9443
Distribusi Terpilih:	Lognormal	0.9587

<i>Summary Index of Fit Cleaning</i>		
1. <i>Index of Fit</i> untuk Distribusi Normal:		0.9149
2. <i>Index of Fit</i> untuk Distribusi Lognormal:		0.9378
3. <i>Index of Fit</i> untuk Distribusi Eksponensial:		-0.9400
4. <i>Index of Fit</i> untuk Distribusi Weibull:		0.8839
Distribusi Terpilih:	Lognormal	0.9378

<i>Summary Index of Fit Module Punch</i>		
1. <i>Index of Fit</i> untuk Distribusi Normal:		0.9337
2. <i>Index of Fit</i> untuk Distribusi Lognormal:		0.9394
3. <i>Index of Fit</i> untuk Distribusi Eksponensial:		-0.9027
4. <i>Index of Fit</i> untuk Distribusi Weibull:		0.9080
Distribusi Terpilih:	Lognormal	0.9394

<i>Summary Index of Fit Tacking</i>		
1. <i>Index of Fit</i> untuk Distribusi Normal:		0.9393
2. <i>Index of Fit</i> untuk Distribusi Lognormal:		0.9577
3. <i>Index of Fit</i> untuk Distribusi Eksponensial:		-0.9149
4. <i>Index of Fit</i> untuk Distribusi Weibull:		0.9457
Distribusi Terpilih:	Lognormal	0.9577

<i>Summary Index of Fit Welding</i>		
1. <i>Index of Fit</i> untuk Distribusi Normal:		0.9360
2. <i>Index of Fit</i> untuk Distribusi Lognormal:		0.9404
3. <i>Index of Fit</i> untuk Distribusi Eksponensial:		-0.8866
4. <i>Index of Fit</i> untuk Distribusi Weibull:		0.9253
Distribusi Terpilih:	Lognormal	0.9404

Lampiran 10
Perhitungan Parameter dan Nilai MTTF

1. CID (Card Input Device)

$$b = \frac{\sum_{i=1}^N TiYi - \frac{\sum_{i=1}^N Ti \sum_{i=1}^N Yi}{N}}{\sum_{i=1}^N Ti^2 - \frac{(\sum_{i=1}^N Ti)^2}{N}} = \frac{-85.49 - \frac{(158.2581)(-13.1673)}{24}}{1043.62 - \frac{(158.2581)^2}{24}} = 25.58$$

$$a = \frac{\sum_{i=1}^N Yi}{N} - b \frac{\sum_{i=1}^N Ti}{N} = \frac{-13.1673}{24} - (25.58) \left(\frac{158.2581}{24} \right) = -169.23$$

Parameter bentuk (β) = $b = 25.58$

$$\text{Parameter skala } (\theta) = e^{-\frac{a}{b}} = e^{-\frac{(-169.23)}{25.58}} = 746.74$$

$$\begin{aligned} MTF &= \theta \tau \left(1 + \frac{1}{\beta} \right) \\ &= 746.74 \tau \left(1 + \frac{1}{25.58} \right) \\ &= 746.74 \tau (1.04) \\ &= 746.74 (0.97844) \\ &= 730.64 \text{ jam} \end{aligned}$$

2. Cleaning

$$b = \frac{\sum_{i=1}^N TiYi - \frac{\sum_{i=1}^N Ti \sum_{i=1}^N Yi}{N}}{\sum_{i=1}^N Ti^2 - \frac{(\sum_{i=1}^N Ti)^2}{N}} = \frac{538.13 - \frac{(20766)(0)}{24}}{17982046 - \frac{(20766)^2}{24}} = 0.0377$$

$$a = \frac{\sum_{i=1}^N Yi}{N} - b \frac{\sum_{i=1}^N Ti}{N} = \frac{0}{24} - (0.0377) \left(\frac{20766}{24} \right) = -32.62$$

$$\sigma = \frac{1}{b} = \frac{1}{0.0377} = 26.53$$

$$\mu = -a \cdot \sigma = 32.62 \times 26.53 = 865.41$$

$$MTTF = \mu = 865.41 \text{ jam}$$

3. Module Punch

$$b = \frac{\sum_{i=1}^N TiYi - \frac{\sum_{i=1}^N Ti \sum_{i=1}^N Yi}{N}}{\sum_{i=1}^N Ti^2 - \frac{(\sum_{i=1}^N Ti)^2}{N}} = \frac{501 - \frac{(18561)(0)}{24}}{14366973 - \frac{(18561)^2}{24}} = 0.0405$$

$$a = \frac{\sum_{i=1}^N Y_i}{N} - b \frac{\sum_{i=1}^N T_i}{N} = \frac{0}{24} - (0.0405) \left(\frac{18561}{24} \right) = -31.3217$$

$$\sigma = \frac{1}{b} = \frac{1}{0.0405} = 24.69$$

$$\mu = -a \cdot \sigma = 31.3217 \times 24.69 = 773.33$$

$$MTTF = \mu = 773.33 \text{ jam}$$

4. Tacking

$$b = \frac{\sum_{i=1}^N T_i Y_i - \frac{\sum_{i=1}^N T_i \sum_{i=1}^N Y_i}{N}}{\sum_{i=1}^N T_i^2 - \frac{(\sum_{i=1}^N T_i)^2}{N}} = \frac{-76.31 - \frac{(142.9971)(-13.1673)}{24}}{852.15 - \frac{(142.9971)^2}{24}} = 15.0014$$

$$a = \frac{\sum_{i=1}^N Y_i}{N} - b \frac{\sum_{i=1}^N T_i}{N} = \frac{-13.1673}{24} - (15.0014) \left(\frac{142.9971}{24} \right) = -89.9302$$

$$\text{Parameter bentuk } (\beta) = b = 15.0014$$

$$\text{Parameter skala } (\theta) = e^{-\frac{a}{b}} = e^{-\frac{(-89.9302)}{15.0014}} = 401.33$$

$$\begin{aligned} MTTF &= \theta_{\tau} \left(1 + \frac{1}{\beta} \right) \\ &= 401.33_{\tau} \left(1 + \frac{1}{15.0014} \right) \\ &= 401.33_{\tau} (1.07) \\ &= 401.33 (0.96415) \\ &= 386.94 \text{ jam} \end{aligned}$$

5. Welding

$$\mu = \bar{T}_i = \frac{\sum_{i=1}^N T_i}{N} = \frac{152.5957}{24} = 6.3582$$

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (T_i - \bar{T}_i)^2}{N}} = \sqrt{\frac{0.03}{24}} = 0.0354$$

$$MTTF = e^{\mu + \frac{\sigma^2}{2}} = e^{6.3582 + \frac{0.0354^2}{2}} = 577.57 \text{ jam}$$

Lampiran 11
Perhitungan Parameter dan Nilai MTTR

1. CID (Card Input Device)

$$\mu = \bar{T}_i = \frac{\sum_{i=1}^N T_i}{N} = \frac{82.6096}{24} = 3.44$$

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (T_i - \bar{T}_i)^2}{N}} = \sqrt{\frac{4.3923}{24}} = 0.43$$

$$MTTR = e^{\mu + \frac{\sigma^2}{2}} = e^{3.44 + \frac{0.43^2}{2}} = 34.21 \text{ menit}$$

2. Cleaning

$$\mu = \bar{T}_i = \frac{\sum_{i=1}^N T_i}{N} = \frac{92.1437}{24} = 3.8393$$

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (T_i - \bar{T}_i)^2}{N}} = \sqrt{\frac{3.7635}{24}} = 0.3960$$

$$MTTR = e^{\mu + \frac{\sigma^2}{2}} = e^{3.8393 + \frac{0.3960^2}{2}} = 50.29 \text{ menit}$$

3. Module Punch

$$\mu = \bar{T}_i = \frac{\sum_{i=1}^N T_i}{N} = \frac{105.9954}{24} = 4.4165$$

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (T_i - \bar{T}_i)^2}{N}} = \sqrt{\frac{1.4922}{24}} = 0.2493$$

$$MTTR = e^{\mu + \frac{\sigma^2}{2}} = e^{4.4165 + \frac{0.2493^2}{2}} = 85.42 \text{ menit}$$

4. Tacking

$$\mu = \bar{T}_i = \frac{\sum_{i=1}^N T_i}{N} = \frac{83.1692}{24} = 3.4654$$

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (T_i - \bar{T}_i)^2}{N}} = \sqrt{\frac{4.7549}{24}} = 0.4451$$

$$MTTR = e^{\mu + \frac{\sigma^2}{2}} = e^{3.4654 + \frac{0.4451^2}{2}} = 35.32 \text{ menit}$$

5. Welding

$$\mu = \bar{T}_i = \frac{\sum_{i=1}^N T_i}{N} = \frac{95.3750}{24} = 3.9740$$

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (T_i - \bar{T}_i)^2}{N}} = \sqrt{\frac{3.8845}{24}} = 0.4023$$

$$MTTR = e^{\mu + \frac{\sigma^2}{2}} = e^{3.9740 + \frac{0.4023^2}{2}} = 57.68 \text{ menit}$$