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LAMPIRAN

Lampiran 1. Data Cacat Poduksi roti di D’roti Bakery & Cake

Tanggal	Jumlah Produksi	Jumlah Produk Cacat
1 November 2022	212	11
2 November 2022	205	14
3 November 2022	228	10
4 November 2022	194	8
5 November 2022	214	9
6 November 2022	230	8
7 November 2022	211	7
8 November 2022	175	10
9 November 2022	203	13
10 November 2022	233	9
11 November 2022	228	6
12 November 2022	204	12
13 November 2022	220	10
14 November 2022	206	14
15 November 2022	210	9
16 November 2022	200	9
17 November 2022	182	7
18 November 2022	207	9
19 November 2022	188	13
20 November 2022	195	6
21 November 2022	218	5
22 November 2022	213	10
23 November 2022	231	12
24 November 2022	192	9
25 November 2022	205	13
26 November 2022	198	6
27 November 2022	204	8
28 November 2022	178	6
29 November 2022	213	10
30 November 2022	207	12
1 Desember 2022	250	12
2 Desember 2022	200	11
3 Desember 2022	214	13
4 Desember 2022	204	9
5 Desember 2022	205	8
6 Desember 2022	260	12

Lampiran 1. Data Cacat Poduksi roti di D'roti Bakery & Cake

Tanggal	Jumlah Produksi	Jumlah Produk Cacat
7 Desember 2022	208	9
8 Desember 2022	211	10
9 Desember 2022	221	12
10 Desember 2022	218	7
11 Desember 2022	210	8
12 Desember 2022	250	12
13 Desember 2022	229	10
14 Desember 2022	241	11
15 Desember 2022	232	11
16 Desember 2022	238	8
17 Desember 2022	200	10
18 Desember 2022	207	9
19 Desember 2022	255	13
20 Desember 2022	244	12
21 Desember 2022	223	14
22 Desember 2022	211	7
23 Desember 2022	236	11
24 Desember 2022	229	10
25 Desember 2022	237	10
26 Desember 2022	234	14
27 Desember 2022	231	11
28 Desember 2022	231	12
29 Desember 2022	225	7
30 Desember 2022	229	10

Lampiran 2. Uji Kolmogorov-Smirnov

One-Sample Kolmogorov-Smirnov Test

		Data
N		60
Normal Parameters ^{a,b}	Mean	9.9667
	Std. Deviation	2.32136
Most Extreme Differences	Absolute	.109
	Positive	.094
	Negative	-.109
Test Statistic		.109
Asymp. Sig. (2-tailed)		.071 ^c

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

Lampiran 3. Tabel Nilai Kritis Uji Normalitas Kolmogorov-Smirnov

<i>n</i>	$\alpha = 0,20$	$\alpha = 0,10$	$\alpha = 0,05$	$\alpha = 0,02$	$\alpha = 0,01$
1	0.900	0.950	0.975	0.990	0.995
2	0.684	0.776	0.842	0.900	0.929
3	0.565	0.636	0.708	0.785	0.829
4	0.493	0.565	0.624	0.689	0.734
5	0.447	0.509	0.563	0.627	0.669
6	0.410	0.468	0.519	0.577	0.617
7	0.381	0.436	0.483	0.538	0.576
8	0.359	0.410	0.454	0.507	0.542
9	0.339	0.387	0.430	0.480	0.513
10	0.323	0.369	0.409	0.457	0.486
11	0.308	0.352	0.391	0.437	0.468
12	0.296	0.338	0.375	0.419	0.449
13	0.285	0.325	0.361	0.404	0.432
14	0.275	0.314	0.349	0.390	0.418
15	0.266	0.304	0.338	0.377	0.404
16	0.258	0.295	0.327	0.366	0.392
17	0.250	0.286	0.318	0.355	0.381
18	0.244	0.279	0.309	0.346	0.371
19	0.237	0.271	0.301	0.337	0.361
20	0.232	0.265	0.294	0.329	0.352
21	0.226	0.259	0.287	0.321	0.344
22	0.221	0.253	0.281	0.314	0.337
23	0.216	0.247	0.275	0.307	0.330
24	0.212	0.242	0.269	0.301	0.323
25	0.208	0.238	0.264	0.295	0.317
26	0.204	0.233	0.259	0.290	0.311
27	0.200	0.229	0.254	0.284	0.305
28	0.197	0.225	0.250	0.279	0.300
29	0.193	0.221	0.246	0.275	0.295
30	0.190	0.218	0.242	0.270	0.290
35	0.177	0.202	0.224	0.251	0.269
40	0.165	0.189	0.210	0.235	0.252
45	0.156	0.179	0.198	0.222	0.238
50	0.148	0.170	0.188	0.211	0.226
55	0.142	0.162	0.180	0.201	0.216
60	0.136	0.155	0.172	0.193	0.207
65	0.131	0.149	0.166	0.185	0.199

Lampiran 4. Bagan Kendali EWMA untuk $\lambda = 0.75$

No	Jumlah cacat	E_t	UCL	LCL	CL	Status
1	11	10.7417	15.1898	4.7436	9.9667	<i>In Control</i>
2	14	13.1854	15.3505	4.5829	9.9667	<i>In Control</i>
3	10	10.7964	15.3604	4.5730	9.9667	<i>In Control</i>
4	8	8.6991	15.3610	4.5724	9.9667	<i>In Control</i>
5	9	8.9248	15.3610	4.5723	9.9667	<i>In Control</i>
6	8	8.2312	15.3610	4.5723	9.9667	<i>In Control</i>
7	7	7.3078	15.3610	4.5723	9.9667	<i>In Control</i>
8	10	9.3269	15.3610	4.5723	9.9667	<i>In Control</i>
9	13	12.0817	15.3610	4.5723	9.9667	<i>In Control</i>
10	9	9.7704	15.3610	4.5723	9.9667	<i>In Control</i>
11	6	6.9426	15.3610	4.5723	9.9667	<i>In Control</i>
12	12	10.7357	15.3610	4.5723	9.9667	<i>In Control</i>
13	10	10.1839	15.3610	4.5723	9.9667	<i>In Control</i>
14	14	13.0460	15.3610	4.5723	9.9667	<i>In Control</i>
15	9	10.0115	15.3610	4.5723	9.9667	<i>In Control</i>
16	9	9.2529	15.3610	4.5723	9.9667	<i>In Control</i>
17	7	7.5632	15.3610	4.5723	9.9667	<i>In Control</i>
18	9	8.6408	15.3610	4.5723	9.9667	<i>In Control</i>
19	13	11.9102	15.3610	4.5723	9.9667	<i>In Control</i>
20	6	7.4776	15.3610	4.5723	9.9667	<i>In Control</i>
21	5	5.6194	15.3610	4.5723	9.9667	<i>In Control</i>
22	10	8.9048	15.3610	4.5723	9.9667	<i>In Control</i>
23	12	11.2262	15.3610	4.5723	9.9667	<i>In Control</i>
24	9	9.5566	15.3610	4.5723	9.9667	<i>In Control</i>
25	13	12.1391	15.3610	4.5723	9.9667	<i>In Control</i>
26	6	7.5348	15.3610	4.5723	9.9667	<i>In Control</i>
27	8	7.8837	15.3610	4.5723	9.9667	<i>In Control</i>
28	6	6.4709	15.3610	4.5723	9.9667	<i>In Control</i>
29	10	9.1177	15.3610	4.5723	9.9667	<i>In Control</i>
30	12	11.2794	15.3610	4.5723	9.9667	<i>In Control</i>
31	12	11.8199	15.3610	4.5723	9.9667	<i>In Control</i>
32	11	11.2050	15.3610	4.5723	9.9667	<i>In Control</i>
33	13	12.5512	15.3610	4.5723	9.9667	<i>In Control</i>
34	9	9.8878	15.3610	4.5723	9.9667	<i>In Control</i>
35	8	8.4720	15.3610	4.5723	9.9667	<i>In Control</i>
36	12	11.1180	15.3610	4.5723	9.9667	<i>In Control</i>
37	9	9.5295	15.3610	4.5723	9.9667	<i>In Control</i>

Lampiran 4. Bagan Kendali EWMA untuk $\lambda = 0.75$

No	Jumlah cacat	E_t	UCL	LCL	CL	Status
38	10	9.8824	15.3610	4.5723	9.9667	<i>In Control</i>
39	12	11.4706	15.3610	4.5723	9.9667	<i>In Control</i>
40	7	8.1176	15.3610	4.5723	9.9667	<i>In Control</i>
41	8	8.0294	15.3610	4.5723	9.9667	<i>In Control</i>
42	12	11.0074	15.3610	4.5723	9.9667	<i>In Control</i>
43	10	10.2518	15.3610	4.5723	9.9667	<i>In Control</i>
44	11	10.8130	15.3610	4.5723	9.9667	<i>In Control</i>
45	11	10.9532	15.3610	4.5723	9.9667	<i>In Control</i>
46	8	8.7383	15.3610	4.5723	9.9667	<i>In Control</i>
47	10	9.6846	15.3610	4.5723	9.9667	<i>In Control</i>
48	9	9.1711	15.3610	4.5723	9.9667	<i>In Control</i>
49	13	12.0428	15.3610	4.5723	9.9667	<i>In Control</i>
50	12	12.0107	15.3610	4.5723	9.9667	<i>In Control</i>
51	14	13.5027	15.3610	4.5723	9.9667	<i>In Control</i>
52	7	8.6257	15.3610	4.5723	9.9667	<i>In Control</i>
53	11	10.4064	15.3610	4.5723	9.9667	<i>In Control</i>
54	10	10.1016	15.3610	4.5723	9.9667	<i>In Control</i>
55	10	10.0254	15.3610	4.5723	9.9667	<i>In Control</i>
56	14	13.0064	15.3610	4.5723	9.9667	<i>In Control</i>
57	11	11.5016	15.3610	4.5723	9.9667	<i>In Control</i>
58	12	11.8754	15.3610	4.5723	9.9667	<i>In Control</i>
59	7	8.2188	15.3610	4.5723	9.9667	<i>In Control</i>
60	10	9.5547	15.3610	4.5723	9.9667	<i>In Control</i>

Lampiran 5. Bagan Kendali EWMA untuk $\lambda = 0.85$

No	Jumlah cacat	E_t	UCL	LCL	CL	Status
1	11	10.8450	15.8863	4.0471	9.9667	<i>In Control</i>
2	14	13.5268	15.9524	3.9810	9.9667	<i>In Control</i>
3	10	10.5290	15.9538	3.9795	9.9667	<i>In Control</i>
4	8	8.3794	15.9539	3.9795	9.9667	<i>In Control</i>
5	9	8.9069	15.9539	3.9795	9.9667	<i>In Control</i>
6	8	8.1360	15.9539	3.9795	9.9667	<i>In Control</i>
7	7	7.1704	15.9539	3.9795	9.9667	<i>In Control</i>
8	10	9.5756	15.9539	3.9795	9.9667	<i>In Control</i>
9	13	12.4863	15.9539	3.9795	9.9667	<i>In Control</i>
10	9	9.5230	15.9539	3.9795	9.9667	<i>In Control</i>
11	6	6.5284	15.9539	3.9795	9.9667	<i>In Control</i>
12	12	11.1793	15.9539	3.9795	9.9667	<i>In Control</i>
13	10	10.1769	15.9539	3.9795	9.9667	<i>In Control</i>
14	14	13.4265	15.9539	3.9795	9.9667	<i>In Control</i>
15	9	9.6640	15.9539	3.9795	9.9667	<i>In Control</i>
16	9	9.0996	15.9539	3.9795	9.9667	<i>In Control</i>
17	7	7.3149	15.9539	3.9795	9.9667	<i>In Control</i>
18	9	8.7472	15.9539	3.9795	9.9667	<i>In Control</i>
19	13	12.3621	15.9539	3.9795	9.9667	<i>In Control</i>
20	6	6.9543	15.9539	3.9795	9.9667	<i>In Control</i>
21	5	5.2931	15.9539	3.9795	9.9667	<i>In Control</i>
22	10	9.2940	15.9539	3.9795	9.9667	<i>In Control</i>
23	12	11.5941	15.9539	3.9795	9.9667	<i>In Control</i>
24	9	9.3891	15.9539	3.9795	9.9667	<i>In Control</i>
25	13	12.4584	15.9539	3.9795	9.9667	<i>In Control</i>
26	6	6.9688	15.9539	3.9795	9.9667	<i>In Control</i>
27	8	7.8453	15.9539	3.9795	9.9667	<i>In Control</i>
28	6	6.2768	15.9539	3.9795	9.9667	<i>In Control</i>
29	10	9.4415	15.9539	3.9795	9.9667	<i>In Control</i>
30	12	11.6162	15.9539	3.9795	9.9667	<i>In Control</i>
31	12	11.9424	15.9539	3.9795	9.9667	<i>In Control</i>
32	11	11.1414	15.9539	3.9795	9.9667	<i>In Control</i>
33	13	12.7212	15.9539	3.9795	9.9667	<i>In Control</i>
34	9	9.5582	15.9539	3.9795	9.9667	<i>In Control</i>
35	8	8.2337	15.9539	3.9795	9.9667	<i>In Control</i>
36	12	11.4351	15.9539	3.9795	9.9667	<i>In Control</i>
37	9	9.3653	15.9539	3.9795	9.9667	<i>In Control</i>

Lampiran 5. Bagan Kendali EWMA untuk $\lambda = 0.85$

No	Jumlah cacat	E_t	UCL	LCL	CL	Status
38	10	9.9048	15.9539	3.9795	9.9667	<i>In Control</i>
39	12	11.6857	15.9539	3.9795	9.9667	<i>In Control</i>
40	7	7.7029	15.9539	3.9795	9.9667	<i>In Control</i>
41	8	7.9554	15.9539	3.9795	9.9667	<i>In Control</i>
42	12	11.3933	15.9539	3.9795	9.9667	<i>In Control</i>
43	10	10.2090	15.9539	3.9795	9.9667	<i>In Control</i>
44	11	10.8813	15.9539	3.9795	9.9667	<i>In Control</i>
45	11	10.9822	15.9539	3.9795	9.9667	<i>In Control</i>
46	8	8.4473	15.9539	3.9795	9.9667	<i>In Control</i>
47	10	9.7671	15.9539	3.9795	9.9667	<i>In Control</i>
48	9	9.1151	15.9539	3.9795	9.9667	<i>In Control</i>
49	13	12.4173	15.9539	3.9795	9.9667	<i>In Control</i>
50	12	12.0626	15.9539	3.9795	9.9667	<i>In Control</i>
51	14	13.7094	15.9539	3.9795	9.9667	<i>In Control</i>
52	7	8.0064	15.9539	3.9795	9.9667	<i>In Control</i>
53	11	10.5510	15.9539	3.9795	9.9667	<i>In Control</i>
54	10	10.0826	15.9539	3.9795	9.9667	<i>In Control</i>
55	10	10.0124	15.9539	3.9795	9.9667	<i>In Control</i>
56	14	13.4019	15.9539	3.9795	9.9667	<i>In Control</i>
57	11	11.3603	15.9539	3.9795	9.9667	<i>In Control</i>
58	12	11.9040	15.9539	3.9795	9.9667	<i>In Control</i>
59	7	7.7356	15.9539	3.9795	9.9667	<i>In Control</i>
60	10	9.6603	15.9539	3.9795	9.9667	<i>In Control</i>

Lampiran 6. Bagan Kendali HEWMA untuk $\lambda_1 = 0.4$ dan $\lambda_2 = 0.75$

No	Jumlah cacat	HEt	UCL	LCL	CL	Status
1	11	10.2767	10.5092	9.4242	9.9667	<i>In Control</i>
2	14	11.4402	11.3747	8.5586	9.9667	<i>Out Of Control</i>
3	10	11.1826	11.6654	8.2680	9.9667	<i>In Control</i>
4	8	10.1892	11.7718	8.1615	9.9667	<i>In Control</i>
5	9	9.6834	11.8107	8.1227	9.9667	<i>In Control</i>
6	8	9.1025	11.8247	8.1086	9.9667	<i>In Control</i>
7	7	8.3846	11.8298	8.1035	9.9667	<i>In Control</i>
8	10	8.7616	11.8317	8.1017	9.9667	<i>In Control</i>
9	13	10.0896	11.8323	8.1010	9.9667	<i>In Control</i>
10	9	9.9620	11.8326	8.1008	9.9667	<i>In Control</i>
11	6	8.7542	11.8327	8.1007	9.9667	<i>In Control</i>
12	12	9.5468	11.8327	8.1006	9.9667	<i>In Control</i>
13	10	9.8016	11.8327	8.1006	9.9667	<i>In Control</i>
14	14	11.0994	11.8327	8.1006	9.9667	<i>In Control</i>
15	9	10.6642	11.8327	8.1006	9.9667	<i>In Control</i>
16	9	10.0997	11.8327	8.1006	9.9667	<i>In Control</i>
17	7	9.0851	11.8327	8.1006	9.9667	<i>In Control</i>
18	9	8.9074	11.8327	8.1006	9.9667	<i>In Control</i>
19	13	10.1085	11.8327	8.1006	9.9667	<i>In Control</i>
20	6	9.0561	11.8327	8.1006	9.9667	<i>In Control</i>
21	5	7.6814	11.8327	8.1006	9.9667	<i>Out Of Control</i>
22	10	8.1708	11.8327	8.1006	9.9667	<i>In Control</i>
23	12	9.3930	11.8327	8.1006	9.9667	<i>In Control</i>
24	9	9.4584	11.8327	8.1006	9.9667	<i>In Control</i>
25	13	10.5307	11.8327	8.1006	9.9667	<i>In Control</i>
26	6	9.3323	11.8327	8.1006	9.9667	<i>In Control</i>
27	8	8.7529	11.8327	8.1006	9.9667	<i>In Control</i>
28	6	7.8401	11.8327	8.1006	9.9667	<i>Out Of Control</i>
29	10	8.3511	11.8327	8.1006	9.9667	<i>In Control</i>
30	12	9.5225	11.8327	8.1006	9.9667	<i>In Control</i>
31	12	10.4414	11.8327	8.1006	9.9667	<i>In Control</i>
32	11	10.7468	11.8327	8.1006	9.9667	<i>In Control</i>
33	13	11.4686	11.8327	8.1006	9.9667	<i>In Control</i>
34	9	10.8363	11.8327	8.1006	9.9667	<i>In Control</i>
35	8	9.8906	11.8327	8.1006	9.9667	<i>In Control</i>
36	12	10.3815	11.8327	8.1006	9.9667	<i>In Control</i>
37	9	10.0407	11.8327	8.1006	9.9667	<i>In Control</i>

Lampiran 6. Bagan Kendali HEWMA untuk $\lambda_1 = 0.4$ dan $\lambda_2 = 0.75$

No	Jumlah cacat	HEt	UCL	LCL	CL	Status
38	10	9.9774	11.8327	8.1006	9.9667	<i>In Control</i>
39	12	10.5747	11.8327	8.1006	9.9667	<i>In Control</i>
40	7	9.5919	11.8327	8.1006	9.9667	<i>In Control</i>
41	8	8.9669	11.8327	8.1006	9.9667	<i>In Control</i>
42	12	9.7831	11.8327	8.1006	9.9667	<i>In Control</i>
43	10	9.9706	11.8327	8.1006	9.9667	<i>In Control</i>
44	11	10.3075	11.8327	8.1006	9.9667	<i>In Control</i>
45	11	10.5658	11.8327	8.1006	9.9667	<i>In Control</i>
46	8	9.8348	11.8327	8.1006	9.9667	<i>In Control</i>
47	10	9.7747	11.8327	8.1006	9.9667	<i>In Control</i>
48	9	9.5333	11.8327	8.1006	9.9667	<i>In Control</i>
49	13	10.5371	11.8327	8.1006	9.9667	<i>In Control</i>
50	12	11.1265	11.8327	8.1006	9.9667	<i>In Control</i>
51	14	12.0770	11.8327	8.1006	9.9667	<i>Out Of Control</i>
52	7	10.6965	11.8327	8.1006	9.9667	<i>In Control</i>
53	11	10.5804	11.8327	8.1006	9.9667	<i>In Control</i>
54	10	10.3889	11.8327	8.1006	9.9667	<i>In Control</i>
55	10	10.2435	11.8327	8.1006	9.9667	<i>In Control</i>
56	14	11.3486	11.8327	8.1006	9.9667	<i>In Control</i>
57	11	11.4098	11.8327	8.1006	9.9667	<i>In Control</i>
58	12	11.5961	11.8327	8.1006	9.9667	<i>In Control</i>
59	7	10.2452	11.8327	8.1006	9.9667	<i>In Control</i>
60	10	9.9690	11.8327	8.1006	9.9667	<i>In Control</i>

Lampiran 7. Bagan Kendali HEWMA untuk $\lambda_1 = 0.4$ dan $\lambda_2 = 0.85$

No	Jumlah cacat	HE_t	UCL	LCL	CL	Status
1	11	10.3180	11.4381	8.4952	9.9667	<i>In Control</i>
2	14	11.6015	11.9865	7.9468	9.9667	<i>In Control</i>
3	10	11.1725	12.1770	7.7563	9.9667	<i>In Control</i>
4	8	10.0552	12.2440	7.6893	9.9667	<i>In Control</i>
5	9	9.5959	12.2679	7.6654	9.9667	<i>In Control</i>
6	8	9.0120	12.2764	7.6569	9.9667	<i>In Control</i>
7	7	8.2753	12.2795	7.6538	9.9667	<i>In Control</i>
8	10	8.7954	12.2806	7.6527	9.9667	<i>In Control</i>
9	13	10.2718	12.2810	7.6523	9.9667	<i>In Control</i>
10	9	9.9723	12.2812	7.6522	9.9667	<i>In Control</i>
11	6	8.5947	12.2812	7.6521	9.9667	<i>In Control</i>
12	12	9.6285	12.2812	7.6521	9.9667	<i>In Control</i>
13	10	9.8479	12.2812	7.6521	9.9667	<i>In Control</i>
14	14	11.2793	12.2812	7.6521	9.9667	<i>In Control</i>
15	9	10.6332	12.2812	7.6521	9.9667	<i>In Control</i>
16	9	10.0198	12.2812	7.6521	9.9667	<i>In Control</i>
17	7	8.9378	12.2812	7.6521	9.9667	<i>In Control</i>
18	9	8.8616	12.2812	7.6521	9.9667	<i>In Control</i>
19	13	10.2618	12.2812	7.6521	9.9667	<i>In Control</i>
20	6	8.9388	12.2812	7.6521	9.9667	<i>In Control</i>
21	5	7.4805	12.2812	7.6521	9.9667	<i>Out Of Control</i>
22	10	8.2059	12.2812	7.6521	9.9667	<i>In Control</i>
23	12	9.5612	12.2812	7.6521	9.9667	<i>In Control</i>
24	9	9.4924	12.2812	7.6521	9.9667	<i>In Control</i>
25	13	10.6788	12.2812	7.6521	9.9667	<i>In Control</i>
26	6	9.1948	12.2812	7.6521	9.9667	<i>In Control</i>
27	8	8.6550	12.2812	7.6521	9.9667	<i>In Control</i>
28	6	7.7037	12.2812	7.6521	9.9667	<i>In Control</i>
29	10	8.3988	12.2812	7.6521	9.9667	<i>In Control</i>
30	12	9.6858	12.2812	7.6521	9.9667	<i>In Control</i>
31	12	10.5884	12.2812	7.6521	9.9667	<i>In Control</i>
32	11	10.8096	12.2812	7.6521	9.9667	<i>In Control</i>
33	13	11.5743	12.2812	7.6521	9.9667	<i>In Control</i>
34	9	10.7678	12.2812	7.6521	9.9667	<i>In Control</i>
35	8	9.7542	12.2812	7.6521	9.9667	<i>In Control</i>
36	12	10.4265	12.2812	7.6521	9.9667	<i>In Control</i>
37	9	10.0020	12.2812	7.6521	9.9667	<i>In Control</i>

Lampiran 7. Bagan Kendali HEWMA untuk $\lambda_1 = 0.4$ dan $\lambda_2 = 0.85$

No	Jumlah cacat	HE_t	UCL	LCL	CL	Status
38	10	9.9631	12.2812	7.6521	9.9667	<i>In Control</i>
39	12	10.6522	12.2812	7.6521	9.9667	<i>In Control</i>
40	7	9.4724	12.2812	7.6521	9.9667	<i>In Control</i>
41	8	8.8656	12.2812	7.6521	9.9667	<i>In Control</i>
42	12	9.8767	12.2812	7.6521	9.9667	<i>In Control</i>
43	10	10.0096	12.2812	7.6521	9.9667	<i>In Control</i>
44	11	10.3583	12.2812	7.6521	9.9667	<i>In Control</i>
45	11	10.6079	12.2812	7.6521	9.9667	<i>In Control</i>
46	8	9.7437	12.2812	7.6521	9.9667	<i>In Control</i>
47	10	9.7530	12.2812	7.6521	9.9667	<i>In Control</i>
48	9	9.4978	12.2812	7.6521	9.9667	<i>In Control</i>
49	13	10.6656	12.2812	7.6521	9.9667	<i>In Control</i>
50	12	11.2244	12.2812	7.6521	9.9667	<i>In Control</i>
51	14	12.2184	12.2812	7.6521	9.9667	<i>In Control</i>
52	7	10.5336	12.2812	7.6521	9.9667	<i>In Control</i>
53	11	10.5405	12.2812	7.6521	9.9667	<i>In Control</i>
54	10	10.3574	12.2812	7.6521	9.9667	<i>In Control</i>
55	10	10.2194	12.2812	7.6521	9.9667	<i>In Control</i>
56	14	11.4924	12.2812	7.6521	9.9667	<i>In Control</i>
57	11	11.4395	12.2812	7.6521	9.9667	<i>In Control</i>
58	12	11.6253	12.2812	7.6521	9.9667	<i>In Control</i>
59	7	10.0694	12.2812	7.6521	9.9667	<i>In Control</i>
60	10	9.9058	12.2812	7.6521	9.9667	<i>In Control</i>

Lampiran 8. Bagan Kendali HEWMA untuk $\lambda_1 = 0.5$ dan $\lambda_2 = 0.75$

No	Jumlah cacat	HE_t	UCL	LCL	CL	Status
1	11	10.3542	11.1346	8.7988	9.9667	<i>In Control</i>
2	14	11.7698	11.9253	8.0080	9.9667	<i>In Control</i>
3	10	11.2831	12.1577	7.7756	9.9667	<i>In Control</i>
4	8	9.9911	12.2228	7.7105	9.9667	<i>In Control</i>
5	9	9.4579	12.2402	7.6932	9.9667	<i>In Control</i>
6	8	8.8446	12.2447	7.6887	9.9667	<i>In Control</i>
7	7	8.0762	12.2458	7.6875	9.9667	<i>In Control</i>
8	10	8.7016	12.2461	7.6872	9.9667	<i>In Control</i>
9	13	10.3917	12.2462	7.6872	9.9667	<i>In Control</i>
10	9	10.0810	12.2462	7.6871	9.9667	<i>In Control</i>
11	6	8.5118	12.2462	7.6871	9.9667	<i>In Control</i>
12	12	9.6237	12.2462	7.6871	9.9667	<i>In Control</i>
13	10	9.9038	12.2462	7.6871	9.9667	<i>In Control</i>
14	14	11.4749	12.2462	7.6871	9.9667	<i>In Control</i>
15	9	10.7432	12.2462	7.6871	9.9667	<i>In Control</i>
16	9	9.9980	12.2462	7.6871	9.9667	<i>In Control</i>
17	7	8.7806	12.2462	7.6871	9.9667	<i>In Control</i>
18	9	8.7107	12.2462	7.6871	9.9667	<i>In Control</i>
19	13	10.3105	12.2462	7.6871	9.9667	<i>In Control</i>
20	6	8.8940	12.2462	7.6871	9.9667	<i>In Control</i>
21	5	7.2567	12.2462	7.6871	9.9667	<i>Out Of Control</i>
22	10	8.0808	12.2462	7.6871	9.9667	<i>In Control</i>
23	12	9.6535	12.2462	7.6871	9.9667	<i>In Control</i>
24	9	9.6050	12.2462	7.6871	9.9667	<i>In Control</i>
25	13	10.8721	12.2462	7.6871	9.9667	<i>In Control</i>
26	6	9.2034	12.2462	7.6871	9.9667	<i>In Control</i>
27	8	8.5436	12.2462	7.6871	9.9667	<i>In Control</i>
28	6	7.5072	12.2462	7.6871	9.9667	<i>Out Of Control</i>
29	10	8.3125	12.2462	7.6871	9.9667	<i>In Control</i>
30	12	9.7960	12.2462	7.6871	9.9667	<i>In Control</i>
31	12	10.8079	12.2462	7.6871	9.9667	<i>In Control</i>
32	11	11.0064	12.2462	7.6871	9.9667	<i>In Control</i>
33	13	11.7788	12.2462	7.6871	9.9667	<i>In Control</i>
34	9	10.8333	12.2462	7.6871	9.9667	<i>In Control</i>
35	8	9.6526	12.2462	7.6871	9.9667	<i>In Control</i>
36	12	10.3853	12.2462	7.6871	9.9667	<i>In Control</i>
37	9	9.9574	12.2462	7.6871	9.9667	<i>In Control</i>

Lampiran 8. Bagan Kendali HEWMA untuk $\lambda_1 = 0.5$ dan $\lambda_2 = 0.75$

No	Jumlah cacat	HE_t	UCL	LCL	CL	Status
38	10	9.9199	12.2462	7.6871	9.9667	<i>In Control</i>
39	12	10.6952	12.2462	7.6871	9.9667	<i>In Control</i>
40	7	9.4064	12.2462	7.6871	9.9667	<i>In Control</i>
41	8	8.7179	12.2462	7.6871	9.9667	<i>In Control</i>
42	12	9.8626	12.2462	7.6871	9.9667	<i>In Control</i>
43	10	10.0572	12.2462	7.6871	9.9667	<i>In Control</i>
44	11	10.4351	12.2462	7.6871	9.9667	<i>In Control</i>
45	11	10.6942	12.2462	7.6871	9.9667	<i>In Control</i>
46	8	9.7162	12.2462	7.6871	9.9667	<i>In Control</i>
47	10	9.7004	12.2462	7.6871	9.9667	<i>In Control</i>
48	9	9.4358	12.2462	7.6871	9.9667	<i>In Control</i>
49	13	10.7393	12.2462	7.6871	9.9667	<i>In Control</i>
50	12	11.3750	12.2462	7.6871	9.9667	<i>In Control</i>
51	14	12.4388	12.2462	7.6871	9.9667	<i>Out Of Control</i>
52	7	10.5323	12.2462	7.6871	9.9667	<i>In Control</i>
53	11	10.4693	12.2462	7.6871	9.9667	<i>In Control</i>
54	10	10.2855	12.2462	7.6871	9.9667	<i>In Control</i>
55	10	10.1554	12.2462	7.6871	9.9667	<i>In Control</i>
56	14	11.5809	12.2462	7.6871	9.9667	<i>In Control</i>
57	11	11.5412	12.2462	7.6871	9.9667	<i>In Control</i>
58	12	11.7083	12.2462	7.6871	9.9667	<i>In Control</i>
59	7	9.9636	12.2462	7.6871	9.9667	<i>In Control</i>
60	10	9.7591	12.2462	7.6871	9.9667	<i>In Control</i>

Lampiran 9. Bagan Kendali HEWMA untuk $\lambda_1 = 0.5$ dan $\lambda_2 = 0.85$

No	Jumlah cacat	HE_t	UCL	LCL	CL	Status
1	11	10.4058	12.1113	7.8221	9.9667	<i>In Control</i>
2	14	11.9663	12.6611	7.2722	9.9667	<i>In Control</i>
3	10	11.2477	12.8053	7.1280	9.9667	<i>In Control</i>
4	8	9.8135	12.8420	7.0913	9.9667	<i>In Control</i>
5	9	9.3602	12.8513	7.0821	9.9667	<i>In Control</i>
6	8	8.7481	12.8536	7.0797	9.9667	<i>In Control</i>
7	7	7.9593	12.8542	7.0792	9.9667	<i>In Control</i>
8	10	8.7674	12.8543	7.0790	9.9667	<i>In Control</i>
9	13	10.6269	12.8544	7.0790	9.9667	<i>In Control</i>
10	9	10.0749	12.8544	7.0790	9.9667	<i>In Control</i>
11	6	8.3017	12.8544	7.0790	9.9667	<i>In Control</i>
12	12	9.7405	12.8544	7.0790	9.9667	<i>In Control</i>
13	10	9.9587	12.8544	7.0790	9.9667	<i>In Control</i>
14	14	11.6926	12.8544	7.0790	9.9667	<i>In Control</i>
15	9	10.6783	12.8544	7.0790	9.9667	<i>In Control</i>
16	9	9.8889	12.8544	7.0790	9.9667	<i>In Control</i>
17	7	8.6019	12.8544	7.0790	9.9667	<i>In Control</i>
18	9	8.6746	12.8544	7.0790	9.9667	<i>In Control</i>
19	13	10.5183	12.8544	7.0790	9.9667	<i>In Control</i>
20	6	8.7363	12.8544	7.0790	9.9667	<i>In Control</i>
21	5	7.0147	12.8544	7.0790	9.9667	<i>Out Of Control</i>
22	10	8.1544	12.8544	7.0790	9.9667	<i>In Control</i>
23	12	9.8742	12.8544	7.0790	9.9667	<i>In Control</i>
24	9	9.6317	12.8544	7.0790	9.9667	<i>In Control</i>
25	13	11.0450	12.8544	7.0790	9.9667	<i>In Control</i>
26	6	9.0069	12.8544	7.0790	9.9667	<i>In Control</i>
27	8	8.4261	12.8544	7.0790	9.9667	<i>In Control</i>
28	6	7.3514	12.8544	7.0790	9.9667	<i>In Control</i>
29	10	8.3965	12.8544	7.0790	9.9667	<i>In Control</i>
30	12	10.0064	12.8544	7.0790	9.9667	<i>In Control</i>
31	12	10.9744	12.8544	7.0790	9.9667	<i>In Control</i>
32	11	11.0579	12.8544	7.0790	9.9667	<i>In Control</i>
33	13	11.8895	12.8544	7.0790	9.9667	<i>In Control</i>
34	9	10.7239	12.8544	7.0790	9.9667	<i>In Control</i>
35	8	9.4788	12.8544	7.0790	9.9667	<i>In Control</i>
36	12	10.4569	12.8544	7.0790	9.9667	<i>In Control</i>
37	9	9.9111	12.8544	7.0790	9.9667	<i>In Control</i>

Lampiran 9. Bagan Kendali HEWMA untuk $\lambda_1 = 0.5$ dan $\lambda_2 = 0.85$

No	Jumlah cacat	HE_t	UCL	LCL	CL	Status
38	10	9.9079	12.8544	7.0790	9.9667	<i>In Control</i>
39	12	10.7968	12.8544	7.0790	9.9667	<i>In Control</i>
40	7	9.2498	12.8544	7.0790	9.9667	<i>In Control</i>
41	8	8.6026	12.8544	7.0790	9.9667	<i>In Control</i>
42	12	9.9980	12.8544	7.0790	9.9667	<i>In Control</i>
43	10	10.1035	12.8544	7.0790	9.9667	<i>In Control</i>
44	11	10.4924	12.8544	7.0790	9.9667	<i>In Control</i>
45	11	10.7373	12.8544	7.0790	9.9667	<i>In Control</i>
46	8	9.5923	12.8544	7.0790	9.9667	<i>In Control</i>
47	10	9.6797	12.8544	7.0790	9.9667	<i>In Control</i>
48	9	9.3974	12.8544	7.0790	9.9667	<i>In Control</i>
49	13	10.9073	12.8544	7.0790	9.9667	<i>In Control</i>
50	12	11.4850	12.8544	7.0790	9.9667	<i>In Control</i>
51	14	12.5972	12.8544	7.0790	9.9667	<i>In Control</i>
52	7	10.3018	12.8544	7.0790	9.9667	<i>In Control</i>
53	11	10.4264	12.8544	7.0790	9.9667	<i>In Control</i>
54	10	10.2545	12.8544	7.0790	9.9667	<i>In Control</i>
55	10	10.1335	12.8544	7.0790	9.9667	<i>In Control</i>
56	14	11.7677	12.8544	7.0790	9.9667	<i>In Control</i>
57	11	11.5640	12.8544	7.0790	9.9667	<i>In Control</i>
58	12	11.7340	12.8544	7.0790	9.9667	<i>In Control</i>
59	7	9.7348	12.8544	7.0790	9.9667	<i>In Control</i>
60	10	9.6976	12.8544	7.0790	9.9667	<i>In Control</i>

Lampiran 10. Bagan Kendali HEWMA untuk $\lambda_1 = 0.6$ dan $\lambda_2 = 0.75$

No	Jumlah cacat	HE_t	UCL	LCL	CL	Status
1	11	10.4317	11.5660	8.3674	9.9667	<i>In Control</i>
2	14	12.0839	12.3215	7.6119	9.9667	<i>In Control</i>
3	10	11.3114	12.4926	7.4407	9.9667	<i>In Control</i>
4	8	9.7440	12.5272	7.4062	9.9667	<i>In Control</i>
5	9	9.2525	12.5336	7.3998	9.9667	<i>In Control</i>
6	8	8.6397	12.5347	7.3987	9.9667	<i>In Control</i>
7	7	7.8406	12.5349	7.3985	9.9667	<i>In Control</i>
8	10	8.7324	12.5349	7.3984	9.9667	<i>In Control</i>
9	13	10.7420	12.5349	7.3984	9.9667	<i>In Control</i>
10	9	10.1591	12.5349	7.3984	9.9667	<i>In Control</i>
11	6	8.2292	12.5349	7.3984	9.9667	<i>In Control</i>
12	12	9.7331	12.5349	7.3984	9.9667	<i>In Control</i>
13	10	10.0036	12.5349	7.3984	9.9667	<i>In Control</i>
14	14	11.8290	12.5349	7.3984	9.9667	<i>In Control</i>
15	9	10.7385	12.5349	7.3984	9.9667	<i>In Control</i>
16	9	9.8471	12.5349	7.3984	9.9667	<i>In Control</i>
17	7	8.4768	12.5349	7.3984	9.9667	<i>In Control</i>
18	9	8.5752	12.5349	7.3984	9.9667	<i>In Control</i>
19	13	10.5762	12.5349	7.3984	9.9667	<i>In Control</i>
20	6	8.7170	12.5349	7.3984	9.9667	<i>In Control</i>
21	5	6.8584	12.5349	7.3984	9.9667	<i>Out Of Control</i>
22	10	8.0863	12.5349	7.3984	9.9667	<i>In Control</i>
23	12	9.9702	12.5349	7.3984	9.9667	<i>In Control</i>
24	9	9.7220	12.5349	7.3984	9.9667	<i>In Control</i>
25	13	11.1723	12.5349	7.3984	9.9667	<i>In Control</i>
26	6	8.9898	12.5349	7.3984	9.9667	<i>In Control</i>
27	8	8.3261	12.5349	7.3984	9.9667	<i>In Control</i>
28	6	7.2130	12.5349	7.3984	9.9667	<i>Out Of Control</i>
29	10	8.3558	12.5349	7.3984	9.9667	<i>In Control</i>
30	12	10.1100	12.5349	7.3984	9.9667	<i>In Control</i>
31	12	11.1359	12.5349	7.3984	9.9667	<i>In Control</i>
32	11	11.1773	12.5349	7.3984	9.9667	<i>In Control</i>
33	13	12.0017	12.5349	7.3984	9.9667	<i>In Control</i>
34	9	10.7334	12.5349	7.3984	9.9667	<i>In Control</i>
35	8	9.3765	12.5349	7.3984	9.9667	<i>In Control</i>
36	12	10.4214	12.5349	7.3984	9.9667	<i>In Control</i>
37	9	9.8863	12.5349	7.3984	9.9667	<i>In Control</i>

Lampiran 10. Bagan Kendali HEWMA untuk $\lambda_1 = 0.6$ dan $\lambda_2 = 0.75$

No	Jumlah cacat	HE_t	UCL	LCL	CL	Status
38	10	9.8839	12.5349	7.3984	9.9667	<i>In Control</i>
39	12	10.8359	12.5349	7.3984	9.9667	<i>In Control</i>
40	7	9.2050	12.5349	7.3984	9.9667	<i>In Control</i>
41	8	8.4996	12.5349	7.3984	9.9667	<i>In Control</i>
42	12	10.0043	12.5349	7.3984	9.9667	<i>In Control</i>
43	10	10.1528	12.5349	7.3984	9.9667	<i>In Control</i>
44	11	10.5489	12.5349	7.3984	9.9667	<i>In Control</i>
45	11	10.7915	12.5349	7.3984	9.9667	<i>In Control</i>
46	8	9.5596	12.5349	7.3984	9.9667	<i>In Control</i>
47	10	9.6346	12.5349	7.3984	9.9667	<i>In Control</i>
48	9	9.3565	12.5349	7.3984	9.9667	<i>In Control</i>
49	13	10.9683	12.5349	7.3984	9.9667	<i>In Control</i>
50	12	11.5937	12.5349	7.3984	9.9667	<i>In Control</i>
51	14	12.7391	12.5349	7.3984	9.9667	<i>Out Of Control</i>
52	7	10.2710	12.5349	7.3984	9.9667	<i>In Control</i>
53	11	10.3523	12.5349	7.3984	9.9667	<i>In Control</i>
54	10	10.2019	12.5349	7.3984	9.9667	<i>In Control</i>
55	10	10.0960	12.5349	7.3984	9.9667	<i>In Control</i>
56	14	11.8422	12.5349	7.3984	9.9667	<i>In Control</i>
57	11	11.6378	12.5349	7.3984	9.9667	<i>In Control</i>
58	12	11.7804	12.5349	7.3984	9.9667	<i>In Control</i>
59	7	9.6435	12.5349	7.3984	9.9667	<i>In Control</i>
60	10	9.5902	12.5349	7.3984	9.9667	<i>In Control</i>

Lampiran 11. Bagan Kendali HEWMA untuk $\lambda_1 = 0.6$ dan $\lambda_2 = 0.85$

No	Jumlah cacat	HE_t	UCL	LCL	CL	Status
1	11	10.4937	12.8078	7.1256	9.9667	<i>In Control</i>
2	14	12.3135	13.3075	6.6259	9.9667	<i>In Control</i>
3	10	11.2428	13.3998	6.5335	9.9667	<i>In Control</i>
4	8	9.5247	13.4156	6.5178	9.9667	<i>In Control</i>
5	9	9.1540	13.4182	6.5152	9.9667	<i>In Control</i>
6	8	8.5432	13.4186	6.5147	9.9667	<i>In Control</i>
7	7	7.7195	13.4187	6.5147	9.9667	<i>In Control</i>
8	10	8.8332	13.4187	6.5147	9.9667	<i>In Control</i>
9	13	11.0251	13.4187	6.5147	9.9667	<i>In Control</i>
10	9	10.1238	13.4187	6.5147	9.9667	<i>In Control</i>
11	6	7.9666	13.4187	6.5147	9.9667	<i>In Control</i>
12	12	9.8942	13.4187	6.5147	9.9667	<i>In Control</i>
13	10	10.0638	13.4187	6.5147	9.9667	<i>In Control</i>
14	14	12.0814	13.4187	6.5147	9.9667	<i>In Control</i>
15	9	10.6310	13.4187	6.5147	9.9667	<i>In Control</i>
16	9	9.7121	13.4187	6.5147	9.9667	<i>In Control</i>
17	7	8.2738	13.4187	6.5147	9.9667	<i>In Control</i>
18	9	8.5579	13.4187	6.5147	9.9667	<i>In Control</i>
19	13	10.8404	13.4187	6.5147	9.9667	<i>In Control</i>
20	6	8.5087	13.4187	6.5147	9.9667	<i>In Control</i>
21	5	6.5794	13.4187	6.5147	9.9667	<i>In Control</i>
22	10	8.2081	13.4187	6.5147	9.9667	<i>In Control</i>
23	12	10.2397	13.4187	6.5147	9.9667	<i>In Control</i>
24	9	9.7294	13.4187	6.5147	9.9667	<i>In Control</i>
25	13	11.3668	13.4187	6.5147	9.9667	<i>In Control</i>
26	6	8.7280	13.4187	6.5147	9.9667	<i>In Control</i>
27	8	8.1984	13.4187	6.5147	9.9667	<i>In Control</i>
28	6	7.0454	13.4187	6.5147	9.9667	<i>In Control</i>
29	10	8.4831	13.4187	6.5147	9.9667	<i>In Control</i>
30	12	10.3630	13.4187	6.5147	9.9667	<i>In Control</i>
31	12	11.3106	13.4187	6.5147	9.9667	<i>In Control</i>
32	11	11.2091	13.4187	6.5147	9.9667	<i>In Control</i>
33	13	12.1164	13.4187	6.5147	9.9667	<i>In Control</i>
34	9	10.5815	13.4187	6.5147	9.9667	<i>In Control</i>
35	8	9.1728	13.4187	6.5147	9.9667	<i>In Control</i>
36	12	10.5302	13.4187	6.5147	9.9667	<i>In Control</i>
37	9	9.8312	13.4187	6.5147	9.9667	<i>In Control</i>

Lampiran 11. Bagan Kendali HEWMA untuk $\lambda_1 = 0.6$ dan $\lambda_2 = 0.85$

No	Jumlah cacat	HE_t	UCL	LCL	CL	Status
38	10	9.8754	13.4187	6.5147	9.9667	<i>In Control</i>
39	12	10.9616	13.4187	6.5147	9.9667	<i>In Control</i>
40	7	9.0063	13.4187	6.5147	9.9667	<i>In Control</i>
41	8	8.3758	13.4187	6.5147	9.9667	<i>In Control</i>
42	12	10.1863	13.4187	6.5147	9.9667	<i>In Control</i>
43	10	10.1999	13.4187	6.5147	9.9667	<i>In Control</i>
44	11	10.6088	13.4187	6.5147	9.9667	<i>In Control</i>
45	11	10.8328	13.4187	6.5147	9.9667	<i>In Control</i>
46	8	9.4015	13.4187	6.5147	9.9667	<i>In Control</i>
47	10	9.6209	13.4187	6.5147	9.9667	<i>In Control</i>
48	9	9.3174	13.4187	6.5147	9.9667	<i>In Control</i>
49	13	11.1773	13.4187	6.5147	9.9667	<i>In Control</i>
50	12	11.7085	13.4187	6.5147	9.9667	<i>In Control</i>
51	14	12.9090	13.4187	6.5147	9.9667	<i>In Control</i>
52	7	9.9675	13.4187	6.5147	9.9667	<i>In Control</i>
53	11	10.3176	13.4187	6.5147	9.9667	<i>In Control</i>
54	10	10.1766	13.4187	6.5147	9.9667	<i>In Control</i>
55	10	10.0781	13.4187	6.5147	9.9667	<i>In Control</i>
56	14	12.0723	13.4187	6.5147	9.9667	<i>In Control</i>
57	11	11.6451	13.4187	6.5147	9.9667	<i>In Control</i>
58	12	11.8005	13.4187	6.5147	9.9667	<i>In Control</i>
59	7	9.3616	13.4187	6.5147	9.9667	<i>In Control</i>
60	10	9.5408	13.4187	6.5147	9.9667	<i>In Control</i>

Lampiran 12. Syntax ARL Bagan Kendali EWMA

```
import numpy as np
import pandas as pd
import statistics
import scipy.stats as st

data = [11, 14, 10, 8, 9, 8, 7, 10, 13, 9, 6,
        12, 10, 14, 9, 9, 7, 9, 13, 6, 5, 10,
        12, 9, 13, 6, 8, 6, 10, 12, 12, 11, 13,
        9, 8, 12, 9, 10, 12, 7, 8, 12, 10, 11,
        11, 8, 10, 9, 13, 12, 14, 7, 11, 10, 10,
        14, 11, 12, 7, 10]

data = np.array(data)
data

nilai_l = 3

x_bar = np.mean(data)
x_bar

sigma = np.std(data, ddof=1)
sigma

sigma2 = sigma**2
sigma2

lamda_list = [0.01,
              0.02,
              0.03,
              0.04,
              0.05,
              0.06,
              0.07,
              0.08,
              0.09,
              0.1,
              0.15,
              0.2,
              0.25,
              0.3,
              0.35,
```

```

0.4,
0.45,
0.5,
0.55,
0.6,
0.65,
0.7,
0.75,
0.8,
0.85,
0.9,
0.95,
0.99]

columns = ['lambda', 'k', 'ARL']

df = pd.DataFrame(columns =columns)

df

for lamda_i in lamda_list:
    lamda = lamda_i
    lamda2 = lamda**2
    lamda2

    et = [x_bar]

    for i in range(60):
        temp = (lamda*data[i])+((1-lamda)*et[-1])
        et.append(temp)

    et.pop(0)

    index = np.arange(1, 61)
    index

    UCL = x_bar+((nilai_l*sigma)*np.sqrt((lamda*(1-((1-
lamda)**(2*index))))/(2-lamda)))

    UCLcons = x_bar+((nilai_l*sigma)*np.sqrt(lamda/(2-lamda)))

    LCL = x_bar-((nilai_l*sigma)*np.sqrt((lamda*(1-((1-
lamda)**(2*index))))/(2-lamda)))

```

```

LCLcons = x_bar-((nilai_l*sigma)*np.sqrt(lamda/(2-lamda)))

varians = (lamda*sigma2*(1-(1-lamda)**(2*index)))/(2-lamda)

varianscons = varians[-1]

sdcons = np.sqrt(varianscons)

k = [0,
      0.01,
      0.05,
      0.1,
      0.25,
      0.5,
      0.75,
      1,
      1.25,
      1.5,
      1.75,
      2,
      3]

# membangkitkan data

def data_simulasi(xbar, sigma, nilai_k):
    jumlah_simulasi = 1000
    np.random.seed(1)
    data_simulasi = np.random.normal(loc=xbar, scale=sigma,
    size=jumlah_simulasi)

    return np.mean(data_simulasi), np.std(data_simulasi)

for nilai_k in k:
    xbar_i, sigma_i = data_simulasi(x_bar, sigma, nilai_k)
    Z_ucl= (UCLcons-xbar_i-(sigma_i*nilai_k))/(sdcons)
    Z_lcl = (LCLcons-xbar_i-(sigma_i*nilai_k))/(sdcons)
    beta = st.norm.cdf(Z_ucl)-st.norm.cdf(Z_lcl)
    df.loc[len(df)] = [lamda, nilai_k, 1/(1-beta)]

#Nilai ARL EWMA untuk n lainnya dapat diperoleh dengan menggunakan syntax
yang sama

```

Lampiran 13. Syntax ARL Bagan Kendali HEWMA

```
import numpy as np
import pandas as pd
import statistics
import scipy.stats as st

data = [11, 14, 10, 8, 9, 8, 7, 10, 13, 9, 6,
        12, 10, 14, 9, 9, 7, 9, 13, 6, 5, 10,
        12, 9, 13, 6, 8, 6, 10, 12, 12, 11, 13,
        9, 8, 12, 9, 10, 12, 7, 8, 12, 10, 11,
        11, 8, 10, 9, 13, 12, 14, 7, 11, 10, 10,
        14, 11, 12, 7, 10]

data = np.array(data)

nilai_l = 3

x_bar = np.mean(data)

sigma = np.std(data, ddof=1)

sigma2 = sigma**2

lamda_list = [0.01,
              0.02,
              0.03,
              0.04,
              0.05,
              0.06,
              0.07,
              0.08,
              0.09,
              0.1,
              0.15,
              0.2,
              0.25,
              0.3,
              0.35,
              0.4,
              0.45,
```

```

        0.5,
        0.55,
        0.6,
        0.65,
        0.7,
        0.75,
        0.8,
        0.85,
        0.9,
        0.95,
        0.99]

columns = ['lambda', 'lamdab', 'k', 'ARL']

df2 = pd.DataFrame(columns =columns)

df2

for nilai_lamda in lamda_list:
    for nilai_lamdab in lamda_list:
        if nilai_lamda == nilai_lamdab:
            continue
        lamda = nilai_lamda
        lamda2 = lamda**2

        et = [x_bar]

        for i in range(60):
            temp = (lamda*data[i])+((1-lamda)*et[-1])
            et.append(temp)

        et.pop(0)

        lamdab = nilai_lamdab

        het = [x_bar]
        for nilai_et in et:
            temp = (lamdab*nilai_et)+((1-lamdab)*het[-1])
            het.append(temp)
        het.pop(0)

        index = np.arange(1, 61)

```

```

    varians = (((lamdab*lamda)/(lamdab-lamda))**2)*((((1-
lamdab)**2)*(1-((1-lamdab)**(2*index))))/(1-((1-
lamda)**2)))+((((1-lamda)**2)*(1-((1-lamda)**(2*index))))/(1-((1-
lamda)**2)))-(2*(1-lamda)*(1-lamdab)*(((1-((1-
lamdab)**index)*(1-lamda)**index))/(1-((1-lamdab)*(1-
lamda)))))))*sigma2

    varianscons = varians[-1]

    UCL = x_bar+(nilai_l*(np.sqrt(varians)))

    UCLcons = UCL[-1]

    LCL= x_bar-(nilai_l*(np.sqrt(varians)))

    sdcons = np.sqrt(varianscons)

    k = [0,
        0.01,
        0.05,
        0.1,
        0.25,
        0.5,
        0.75,
        1,
        1.25,
        1.5,
        1.75,
        2,
        3]

# membangkitkan data

def data_simulasi(xbar, sigma, nilai_k):
    jumlah_simulasi = 1000
    np.random.seed(1)
    data_simulasi = np.random.normal(loc=xbar, scale=sigma,
size=jumlah_simulasi)

    return np.mean(data_simulasi), np.std(data_simulasi)

```

```
for nilai_k in k:  
    xbar_i, sigma_i = data_simulasi(x_bar, sigma,  
    nilai_k)  
    Z_ucl= (UCLcons-xbar_i-(sigma_i*nilai_k))/(sdcons)  
    Z_lcl = (LCLcons-xbar_i-(sigma_i*nilai_k))/(sdcons)  
    beta = st.norm.cdf(Z_ucl)-st.norm.cdf(Z_lcl)  
    df2.loc[len(df2)] = [lamda, lamdab, nilai_k, 1/(1-  
    beta)]
```

#Nilai ARL HEWMA untuk n lainnya dapat diperoleh dengan menggunakan syntax yang sama