

LAMPIRAN

Lampiran 1 Pengukuran dispersi data curah hujan

No.	Tahun	RH (Xi)	RH Rerata (X)	(Xi-X)	(Xi-X) ²	(Xi-X) ³	(Xi-X) ⁴
1	1995	119	114.2565217	4.743478261	22.50058601	106.7310406	506.2763709
2	1996	123	114.2565217	8.743478261	76.4484121	668.4250293	5844.359712
3	1997	69	114.2565217	-45.25652174	2048.15276	-92692.2699	4194929.728
4	1998	88	114.2565217	-26.25652174	689.4049338	-18101.37563	475279.1628
5	1999	80	114.2565217	-34.25652174	1173.509282	-40200.34622	1377124.034
6	2000	95	114.2565217	-19.25652174	370.8136295	-7140.580717	137502.7478
7	2001	111	114.2565217	-3.256521739	10.60493384	-34.53519758	112.4646217
8	2002	146	114.2565217	31.74347826	1007.648412	31986.26546	1015355.322
9	2003	129	114.2565217	14.74347826	217.3701512	3204.792099	47249.78265
10	2004	79	114.2565217	-35.25652174	1243.022325	-43824.64363	1545104.501
11	2005	161	114.2565217	46.74347826	2184.95276	102132.2918	4774018.563
12	2006	134	114.2565217	19.74347826	389.8049338	7696.105237	151947.8864
13	2007	245	114.2565217	130.7434783	17093.85711	2234910.335	292199950.8
14	2008	80	114.2565217	-34.25652174	1173.509282	-40200.34622	1377124.034
15	2009	89	114.2565217	-25.25652174	637.8918904	-16110.9304	406906.0638
16	2010	119	114.2565217	4.743478261	22.50058601	106.7310406	506.2763709
17	2011	118	114.2565217	3.743478261	14.01362949	52.45971735	196.3818115
18	2012	63	114.2565217	-51.25652174	2627.231021	-134662.7239	6902342.837
19	2013	130	114.2565217	15.74347826	247.8571078	3902.132988	61433.14586
20	2014	192.8	114.2565217	78.54347826	6169.077977	484540.842	38057523.09
21	2015	86.6	114.2565217	-27.65652174	764.8831947	-21154.0087	585046.3015
22	2016	80.5	114.2565217	-33.75652174	1139.50276	-38465.64969	1298466.54
23	2017	90	114.2565217	-24.25652174	588.3788469	-14272.02429	346189.6675
Jumlah					39912.93652	2402447.677	354960660

Lampiran 2 Perhitungan curah hujan maksimum menggunakan metode Gumbel

No.	Periode ulang (tahun)	X	S	Sn	Yn	Yt	Xt
1	2	114.2565	42.59371	1.0811			
2	5	114.2565	42.59371	1.0811	0.5283	0.3665	107.8818
3	10	114.2565	42.59371	1.0811	0.5283	1.4999	152.5361
4	20	114.2565	42.59371	1.0811	0.5283	2.2502	182.0968
5	25	114.2565	42.59371	1.0811	0.5283	2.9606	210.0855
6	50	114.2565	42.59371	1.0811	0.5283	3.1985	219.4584
7	100	114.2565	42.59371	1.0811	0.5283	3.9019	247.1713
8	200	114.2565	42.59371	1.0811	0.5283	4.6001	274.6793
9	500	114.2565	42.59371	1.0811	0.5283	5.296	302.0967
10	1000	114.2565	42.59371	1.0811	0.5283	6.214	338.2645
						6.919	366.0405

Lampiran 3 Perhitungan curah hujan maksimum menggunakan metode Normal

No.	Periode ulang (tahun)	X	S	Kt	Xt
1	2	114.2565	42.59371	-0.22	104.8859049
2	5	114.2565	42.59371	0.64	141.5164981
3	10	114.2565	42.59371	1.26	167.9246001
4	20	114.2565	42.59371	1.89	194.7586393
5	25	114.2565	42.59371	2.1	203.703319
6	50	114.2565	42.59371	2.75	231.3892325
7	100	114.2565	42.59371	3.45	261.2048316
8	200	114.2565	42.59371	4.14	290.5944936

Lampiran 4 Pengukuran dispersi logaritma data curah hujan

Tahun	Xi	Log Xi	Log X	Log Xi-Log X	(Log Xi-Log X) ²	(Log Xi-Log X) ³	(Log Xi-Log X) ⁴
1995	119	2.075546961	2.057880999	0.017665963	0.000312086	5.5133E-06	9.73978E-08
1996	123	2.089905111	2.057880999	0.032024113	0.001025544	3.28421E-05	1.05174E-06
1997	69	1.838849091	2.057880999	-0.219031908	0.047974977	-0.010508051	0.002301598
1998	88	1.944482672	2.057880999	-0.113398327	0.012859181	-0.00145821	0.000165359
1999	80	1.903089987	2.057880999	-0.154791012	0.023960257	-0.003708832	0.000574094
2000	95	1.977723605	2.057880999	-0.080157394	0.006425208	-0.000515028	4.12833E-05
2001	111	2.045322979	2.057880999	-0.01255802	0.000157704	-1.98045E-06	2.48705E-08
2002	146	2.164352856	2.057880999	0.106471857	0.011336256	0.001206992	0.000128511
2003	129	2.11058971	2.057880999	0.052708711	0.002778208	0.000146436	7.71844E-06
2004	79	1.897627091	2.057880999	-0.160253908	0.025681315	-0.004115531	0.00065953
2005	161	2.206825876	2.057880999	0.148944877	0.022184576	0.003304279	0.000492155
2006	134	2.127104798	2.057880999	0.069223799	0.004791934	0.000331716	2.29636E-05
2007	245	2.389166084	2.057880999	0.331285085	0.109749808	0.036358474	0.01204502
2008	80	1.903089987	2.057880999	-0.154791012	0.023960257	-0.003708832	0.000574094
2009	89	1.949390007	2.057880999	-0.108490992	0.011770295	-0.001276971	0.00013854
2010	119	2.075546961	2.057880999	0.017665963	0.000312086	5.5133E-06	9.73978E-08
2011	118	2.071882007	2.057880999	0.014001008	0.000196028	2.74459E-06	3.84271E-08
2012	63	1.799340549	2.057880999	-0.258540449	0.066843164	-0.017281662	0.004468009
2013	130	2.113943352	2.057880999	0.056062353	0.003142987	0.000176203	9.87837E-06
2014	192.8	2.28510703	2.057880999	0.227226031	0.051631669	0.011732059	0.002665829
2015	86.6	1.937517892	2.057880999	-0.120363107	0.01448277	-0.001743734	0.000209881
2016	80.5	1.90579588	2.057880999	-0.152085119	0.023129883	-0.003517711	0.000534992

Lampiran 4 Lanjutan

Tahun	Xi	Log Xi	Log X	Log Xi-Log X	(Log Xi-Log X) ²	(Log Xi-Log X) ³	(Log Xi-Log X) ⁴
2017	90	1.954242509	2.057880999	-0.103638489	0.010740936	-0.001113174	0.000115368
Jumlah					0.475451639	0.004353057	0.025156132

Lampiran 5 Perhitungan curah hujan maksimum menggunakan metode Log Pearson

No.	Periode ulang (tahun)	Log X	S	K	$Y = \text{Log } X + K S$	$X = 10^Y$
1	2	2.057880999	0.147008293	-0.011595877	2.056176309	113.8089218
2	5	2.057880999	0.147008293	0.837907337	2.181060326	151.726111
3	10	2.057880999	0.147008293	1.288821104	2.247348389	176.7455097
4	25	2.057880999	0.147008293	2.774191754	2.465710193	292.2201724
5	50	2.057880999	0.147008293	2.090151852	2.365150654	231.8198681
6	100	2.057880999	0.147008293	2.376476171	2.407242704	255.4128268
7	200	2.057880999	0.147008293	2.640118379	2.446000295	279.2545736
8	1000	2.057880999	0.147008293	3.188906011	2.526676628	336.2610936

Lampiran 6 Perhitungan curah hujan maksimum menggunakan metode Log Normal

No.	Tahun	X_i	$\log X_i$	$\log X_i - \log \bar{X}$	$(\log X_i - \log \bar{X})^2$
1	1995	119	2.075547	0.042223353	0.001782812
2	1996	123	2.089905	0.056581503	0.003201466
3	1997	69	1.838849	-0.194474518	0.037820338
4	1998	88	1.944483	-0.088840936	0.007892712
5	1999	80	1.90309	-0.130233622	0.016960796
6	2000	95	1.977724	-0.055600003	0.00309136
7	2001	111	2.045323	0.01199937	0.000143983
8	2002	146	2.164353	0.131029247	0.017168664
9	2003	129	2.11059	0.077266102	0.00597005
10	2004	79	1.897627	-0.135696517	0.018413545
11	2005	161	2.206826	0.173502267	0.030103037
12	2006	134	2.127105	0.09378119	0.008794912
13	2007	245	2.389166	0.355842476	0.126623868
14	2008	80	1.90309	-0.130233622	0.016960796
15	2009	89	1.94939	-0.083933602	0.00704485
16	2010	119	2.075547	0.042223353	0.001782812
17	2011	118	2.071882	0.038558399	0.00148675
18	2012	63	1.799341	-0.233983059	0.054748072
19	2013	130	2.113943	0.080619744	0.006499543
20	2014	192.8	2.285107	0.251783421	0.063394891
21	2015	86.6	1.937518	-0.095805717	0.009178735
22	2016	80.5	1.905796	-0.127527728	0.016263321
23	2017	90	1.954243	-0.079081099	0.00625382
Rerata			2.033324		
Jumlah					0.461581135
S					0.144848061

Periode Ulang	Kt	$\log R_{24}$	R_{24}
2	-0.22	2.001457	100.3361
5	0.64	2.126026	133.6677
10	1.26	2.215832	164.3736
20	1.89	2.307086	202.8086
25	2.1	2.337505	217.5227
50	2.75	2.431656	270.1816
100	3.45	2.533049	341.2317
200	4.14	2.632995	429.5311

Lampiran 7 Hasil analisis dengan metode distribusi Gumbel

Nilai *reduced mean* (Y_n)

N	0	1	2	3	4	5	6	7	8	9
10	0,4952	0,4996	0,5035	0,5070	0,5100	0,5128	0,5157	0,5181	0,5202	0,5220
20	0,5236	0,5252	0,5268	0,5283	0,5296	0,5300	0,5320	0,5332	0,5343	0,5353
30	0,5363	0,5371	0,5380	0,5388	0,5396	0,5400	0,5410	0,5418	0,5424	0,5430
40	0,5463	0,5442	0,5448	0,5453	0,5458	0,5468	0,5468	0,5473	0,5477	0,5481
50	0,5485	0,5489	0,5493	0,5497	0,5501	0,5504	0,5508	0,5511	0,5515	0,5518
60	0,5521	0,5524	0,5527	0,5530	0,5533	0,5535	0,5538	0,5540	0,5543	0,5545
70	0,5548	0,5550	0,5552	0,5555	0,5557	0,5559	0,5561	0,5563	0,5565	0,5567
80	0,5569	0,5570	0,5572	0,5574	0,5576	0,5578	0,5580	0,5581	0,5583	0,5585
90	0,5586	0,5587	0,5589	0,5591	0,5592	0,5593	0,5595	0,5596	0,5598	0,5599
100	0,5600									

Sumber: Soemarto 1999

Nilai *reduced standard deviation* (S_n)

N	0	1	2	3	4	5	6	7	8	9
10	0,9496	0,9676	0,9833	0,9971	1,0095	1,0206	1,0316	1,0411	1,0493	1,0565
20	1,0628	1,0696	1,0754	1,0811	1,0864	1,0315	1,0961	1,1004	1,1047	1,1080
30	1,1124	1,1159	1,1193	1,1226	1,1255	1,1285	1,1313	1,1339	1,1363	1,1388
40	1,1413	1,1436	1,1458	1,1480	1,1499	1,1519	1,1538	1,1557	1,1574	1,1590
50	1,1607	1,1923	1,1638	1,1658	1,1667	1,1681	1,1696	1,1708	1,1721	1,1734
60	1,1747	1,1759	1,1770	1,1782	1,1793	1,1803	1,1814	1,1824	1,1834	1,1844
70	1,1854	1,1863	1,1873	1,1881	1,1890	1,1898	1,1906	1,1915	1,1923	1,1930
80	1,1938	1,1945	1,1953	1,1959	1,1967	1,1973	1,1980	1,1987	1,1994	1,2001
90	1,2007	1,2013	1,2026	1,2032	1,2038	1,2044	1,2046	1,2049	1,2055	1,2060
100	1,2065									

Sumber: Soemarto 1999

Nilai *reduced variate* (Y_{Tr})

Periode Ulang (Tahun)	Reduced Variate	Periode Ulang (Tahun)	Reduced Variate
2	0,3665	100	4,6001
5	1,4999	200	5,2960
10	2,2502	500	6,2140
20	2,9606	1000	6,9190
25	3,1985	5000	8,5390
50	3,9019	10000	9,9210

Sumber: Soemarto 1999

Lampiran 8 Nilai K untuk metode distribusi Log Pearson

Kemencengan (Cs)	Periode Ulang (Tahun)						
	2	5	10	25	50	100	200
	Peluang (%)						
	50	20	10	4	2	1	0,5
3,0	-0,396	0,420	1,180	2,278	3,152	4,051	4,970
2,5	-0,360	0,518	1,250	2,262	3,048	3,845	4,652
2,2	-0,330	0,574	1,284	2,240	2,970	3,705	4,444
2,0	-0,307	0,609	1,302	2,219	2,912	3,605	4,298
1,8	-0,282	0,643	1,318	2,193	2,848	3,499	4,147
1,6	-0,254	0,675	1,329	2,163	2,780	3,388	3,990
1,4	-0,225	0,705	1,337	2,128	2,706	3,271	3,828
1,2	-0,195	0,732	1,340	2,087	2,626	3,149	3,661
1,0	-0,164	0,758	1,340	2,043	2,542	3,022	3,489
0,9	-0,148	0,769	1,339	2,018	2,498	2,957	3,401
0,8	-0,132	0,780	1,336	2,998	2,453	2,891	3,312
0,7	-0,116	0,790	1,333	2,967	2,407	2,824	3,223
0,6	-0,099	0,800	1,328	2,939	2,359	2,755	3,132
0,5	-0,083	0,808	1,323	2,910	2,311	2,686	3,041
0,4	-0,066	0,816	1,317	2,880	2,261	2,615	2,949
0,3	-0,05	0,824	1,309	2,849	2,211	2,544	2,856
0,2	-0,033	0,830	1,301	2,818	2,159	2,472	2,763
0,1	-0,017	0,836	1,292	2,785	2,107	2,400	2,670
0,0	0,000	0,842	1,282	2,751	2,054	2,326	2,576
-0,1	0,017	0,836	1,270	2,761	2,000	2,252	2,482
-0,2	0,033	0,850	1,258	1,680	1,945	2,178	2,388
-0,3	0,050	0,853	1,245	1,643	1,890	2,104	2,294
-0,4	0,066	0,855	1,231	1,606	1,834	2,029	2,201
-0,5	0,083	0,856	1,216	1,567	1,777	1,955	2,108
-0,6	0,099	0,857	1,200	1,528	1,720	1,880	2,016
-0,7	0,116	0,857	1,183	1,488	1,663	1,806	1,926
-0,8	0,132	0,856	1,166	1,488	1,606	1,733	1,873
-0,9	0,148	0,854	1,147	1,407	1,549	1,660	1,749
-1,0	0,164	0,852	1,128	1,366	1,492	1,588	1,664
-1,2	0,195	0,844	1,086	1,282	1,379	1,449	1,501
-1,4	0,225	0,832	1,041	1,198	1,270	1,318	1,351
-1,6	0,254	0,817	0,994	1,116	1,166	1,200	1,216
-1,8	0,282	0,799	0,945	0,035	1,069	1,089	1,097
-2,0	0,307	0,777	0,895	0,959	0,980	0,990	1,995
-2,2	0,330	0,752	0,844	0,888	0,900	0,905	0,907
-2,5	0,360	0,711	0,771	0,793	0,798	0,799	0,800
-3,0	0,396	0,636	0,660	0,666	0,666	0,667	0,667

Sumber: Soemarto 1999

Lampiran 9 Nilai K_T untuk metode distribusi Log Normal

T (Tahun)	K_t
1	-1,86
2	-0,22
3	0,17
4	0,44
5	0,64
6	0,81
7	0,95
8	1,06
9	1,17
10	1,26
11	1,35
12	1,43
13	1,5
14	1,57
15	1,63

T (Tahun)	K_t
20	1,89
25	2,1
30	2,27
35	2,41
40	2,54
45	2,65
50	2,75
55	2,86
60	2,93
65	3,02
70	3,08
75	3,6
80	3,21
85	3,28
90	3,33

T (Tahun)	K_t
90	3,34
100	3,45
110	3,53
120	3,62
130	3,7
140	3,77
150	3,84
160	3,91
170	3,97
180	4,03
190	4,09
200	4,14
221	4,24
240	4,33
260	4,42

Sumber: Soewarno 1995

Lampiran 10 Perhitungan uji kecocokan fungsi distribusi data curah hujan maksimum menggunakan uji Kolmogorov-Smirnov

Tahun	X_i	M	$P(x) = M/(n+1)$	$P(x)$	$f(i) = (X_i - X_{rt})/S$	$P'(x) = M/(n-1)$	$P'(x)$	D
	1	2	3	4=nilai 1-3	5	6	7=nilai 1-6	8=4-7
2007	245	1	0.041666667	0.958333333	3.069548744	0.045454545	0.954545455	0.003787879
2014	192.8	2	0.083333333	0.916666667	1.844015765	0.090909091	0.909090909	0.007575758
2005	161	3	0.125	0.875	1.097426708	0.136363636	0.863636364	0.011363636
2002	146	4	0.166666667	0.833333333	0.745262059	0.181818182	0.818181818	0.015151515
2006	134	5	0.208333333	0.791666667	0.46353034	0.227272727	0.772727273	0.018939394
2013	130	6	0.25	0.75	0.369619767	0.272727273	0.727272727	0.022727273
2003	129	7	0.291666667	0.708333333	0.346142123	0.318181818	0.681818182	0.026515152
1996	123	8	0.333333333	0.666666667	0.205276264	0.363636364	0.636363636	0.03030303
1995	119	9	0.375	0.625	0.111365691	0.409090909	0.590909091	0.034090909
2010	119	10	0.416666667	0.583333333	0.111365691	0.454545455	0.545454545	0.037878788
2011	118	11	0.458333333	0.541666667	0.087888047	0.5	0.5	0.041666667
2001	111	12	0.5	0.5	-0.076455456	0.545454545	0.454545455	0.045454545
2000	95	13	0.541666667	0.458333333	-0.452097748	0.590909091	0.409090909	0.049242424
2017	90	14	0.583333333	0.416666667	-0.569485965	0.636363636	0.363636364	0.053030303
2009	89	15	0.625	0.375	-0.592963608	0.681818182	0.318181818	0.056818182
1998	88	16	0.666666667	0.333333333	-0.616441251	0.727272727	0.272727273	0.060606061
2015	86.6	17	0.708333333	0.291666667	-0.649309952	0.772727273	0.227272727	0.064393939
2016	80.5	18	0.75	0.25	-0.792523576	0.818181818	0.181818182	0.068181818
1999	80	19	0.791666667	0.208333333	-0.804262398	0.863636364	0.136363636	0.071969697
2008	80	20	0.833333333	0.166666667	-0.804262398	0.909090909	0.090909091	0.075757576
2004	79	21	0.875	0.125	-0.827740041	0.954545455	0.045454545	0.079545455

Lampiran 10 Lanjutan

Tahun	X_i	M	$P(x) = M/(n+1)$	$P(x)$	$f(t) = (X_i - X_{rt})/S$	$P(x) = M/(n-1)$	$P(x)$	D
	1	2	3	4=nilai 1-3	5	6	7=nilai 1-6	8=4-7
1997	69	22	0.916666667	0.083333333	-1.062516474	1	0	0.083333333
2012	63	23	0.958333333	0.041666667	-1.203382333	1.045454545	-0.045454545	0.087121212

X_{rt}	114.2565217
S	42.593713
Derajat Signifikansi	0.05
Deritical	0.248
Dmax	0.09
$D_{max} < D_{critical}$	0.09 < 0.248

Lampiran 11 Nilai D kritis untuk uji Kolmogorov-Smirnov

n	α			
	0,20	0,10	0,05	0,01
5	0,45	0,51	0,56	0,67
10	0,32	0,37	0,41	0,49
15	0,27	0,30	0,34	0,40
20	0,23	0,26	0,29	0,36
25	0,21	0,24	0,27	0,32
30	0,19	0,22	0,24	0,29
35	0,18	0,20	0,23	0,27
40	0,17	0,19	0,21	0,25
45	0,18	0,18	0,20	0,24
50	0,15	0,17	0,19	0,23
$n > 50$	1,07	1,22	1,36	1,63
	$\sqrt{n}$	$\sqrt{n}$	$\sqrt{n}$	$\sqrt{n}$

Sumber: Soewarno 1995

Lampiran 12 Nilai β_2 dan intensitas hujan (I) percobaan untuk metode Melchior

Nilai β_2	Lama Hujan (jam)											
	1	2	3	4	5	6	8	10	12	16	20	24
0	44	64	80	89	92	92	93	94	95	96	98	100
10	37	57	70	80	82	84	87	90	91	95	97	100
50	29	45	57	66	70	74	79	83	88	94	96	100
300	20	33	43	52	57	61	69	77	85	93	95	100
~	12	23	32	42	50	54	66	74	83	92	94	100

Sumber: Imam Subarkah 1999

Nilai intensitas hujan (I) percobaan

Luas Ellips (km ²)	I (m ³ /detik/km ²)	Luas Ellips (km ²)	I (m ³ /detik/km ²)	Luas Ellips (km ²)	I (m ³ /detik/km ²)
0,14	29,6	144	4,75	720	2,3
0,72	22,45	216	4	1080	1,185
1,2	19,9	288	3,6	1440	1,155
7,2	14,15	360	3,3	2100	1,12
14	11,85	432	3,05	2880	1
29	9	504	2,85	4320	0,7
72	6,25	576	2,65	5760	0,54
108	5,25	648	2,45	7200	0,48

Sumber: Imam Subarkah 1999

Lampiran 13 Penambahan nilai (angka koreksi) intensitas hujan untuk metode Melchior

<u>tc (menit)</u>	<u>%</u>	<u>tc (menit)</u>	<u>%</u>	<u>tc (menit)</u>	<u>%</u>
0 - 40	2	895 - 980	13	1860 - 1950	24
40 - 115	3	980 - 1070	14	1950 - 2035	25
115 - 190	4	1070 - 1155	15	2035 - 2120	26
190 - 270	5	1155 - 1240	16	2120 - 2210	27
270 - 360	6	1240 - 1330	17	2210 - 2295	28
360 - 450	7	1330 - 1420	18	2295 - 2380	29
450 - 540	8	1420 - 1510	19	2380 - 2465	30
540 - 630	9	1510 - 1595	20	2465 - 2550	31
630 - 720	10	1595 - 1680	21	2550 - 2640	32
720 - 810	11	1680 - 1770	22	2640 - 2725	33
810 - 895	12	1770 - 1860	23	2725 - 2815	34

Sumber: Imam Subarkah 1999