Butwal Power Company Ltd.

HYDRO-CONSULT
E N G I N E E R I N G

CALCULATION FORM

Job:	Jhimruk	khola	**Date:**		**Page**
Subject:	Mean	Monthly	flow	**Job No:** 932045	**Calc. By:**
calculation				**Drg no:**	**Chkd. By:**
					Recommended By:
					Approved By:

Fiscal Year	Shrawan	Bhadra	Ashwin	Kartik	Mangsir	Poush	Magh	Falgun	Chaitra	Baishakh	Jestha	Ashadh
2051/2052		53.262	30.028	10.833	7.508	6.147	4.673	4.373	2.812	2.247		43.021
2052/2053	65.769	69.926	26.753	10.512	8.210	6.117	6.628	6.136	3.847	2.088	2.817	28.787
2053/2054	97.308	92.848	50.074	20.305	9.496	6.945	6.312	4.399	4.488	3.944	3.191	46.506
2054/2055	125.203	70.751	34.591	14.878	11.494	8.040	5.507	5.092	5.099	4.636	3.983	68.407
2055/2056	96.430	123.968	45.183	18.232	11.388	7.084	5.730	4.511	3.775	2.316	9.946	38.920
2056/2057	60.746	110.910	73.758	20.939	10.403	7.572	6.476	5.291	3.974	5.428	25.827	57.252
2057/2058	90.972	117.174	64.708	17.109	10.144	7.342	6.046	5.306	4.121	5.325	10.667	39.448
2058/2059	81.161	113.735	35.917	15.041	8.668	6.707	6.603	5.419	6.745	6.091	5.892	23.502
2059/2060	55.829	65.018	30.404	13.656	7.095	4.595	4.416	5.401				45.839
2060/2061	94.427	92.610	55.656	15.021	8.678	7.220	6.559	4.463	4.215	2.930	4.490	24.205
2061/2062	50.566	34.165	31.649	14.043	8.067	6.373	6.176	4.634	3.694	2.431	1.828	19.973
2062/2063	61.740	83.784	33.344	17.110	9.254	6.375	4.970	4.159	3.706	4.679	11.041	33.471
2063/2064	53.569	40.965	26.486	10.405	7.275	5.704	4.629	5.729	3.898	3.809	4.019	19.370
2064/2065	68.523	90.875	40.892	17.224	9.446	6.826	5.586	4.431	3.970	2.766	6.775	41.597
2065/2066	67.090	66.958	57.386	16.364	8.391	6.324	4.707	3.773	3.156	1.637	4.986	14.919
2066/2067	71.930	68.337	40.595	18.740	8.825	6.734	5.239	4.265	3.122	1.902	2.617	19.004
2067/2068	74.614	74.597	55.239	17.745	9.320	6.615	5.043	4.385	3.466	2.608	5.582	36.650
2068/2069	68.272	70.301	50.332	16.409	8.608	6.887	5.792	4.153	3.664	2.074	1.554	19.604

Butwal Power Company Ltd.

HYDRO-CONSULT
E N G I N E E R I N G

CALCULATION FORM

Job:	**Jhimruk**	**khola**	Date:	Page
Subject:	**Mean Monthly flow**		Job No:	Calc. By:
calculation			Drg no:	Chkd. By:

Recommended By:

Approved By:

2069/2070	64.819	65.475	39.759	13.718	7.643	5.770	5.634	4.840	3.008	3.335	11.670	70.995
2070/2071	110.646	76.755	30.806	18.603	9.773	7.134	6.514	5.453	3.957	2.419	3.774	20.758
2071/2072	73.940	59.781	34.140	16.521	9.062	8.264	6.061	5.644	5.092	4.767	2.603	18.766
2072/2073	67.385	58.640	35.214	12.895	7.892	5.909	5.272	3.939	3.286	2.570	5.439	44.829
2073/2074	130.713	44.636	54.539	22.448	10.110	6.972	5.786	4.810	4.191	5.085	6.342	55.600
2074/2075	68.643	57.671	39.637	13.718	7.651	5.686	4.814	3.762	4.201	2.669	3.538	9.412
2075/2076	48.653	64.626	23.310	10.547	6.656	5.321	6.124	5.498	4.267	2.864	3.174	14.811
2076/2077	41.228	63.799	47.028	15.197	8.143	6.319	6.048	5.321	4.897	8.247	8.826	73.218
2077/2078	83.259	81.707	56.915	16.991	8.416	6.116	4.808	3.778	3.091	5.307	8.046	56.021
2078/2079	73.540	104.512	45.666	39.517	14.677	9.472	8.035	5.813	4.211	5.462	7.312	29.325
2079/2080	53.415	54.419	83.805	27.691	10.801							
Average	**75.014**	**74.904**	**43.925**	**16.980**	**9.072**	**6.663**	**5.721**	**4.813**	**3.998**	**3.690**	**6.382**	**36.222**

Butwal Power Company Ltd.

HYDRO-CONSULT
ENGINEERING

CALCULATION FORM

Job: Jhimruk khola	**Date:**	**Page**
Subject: Mean Monthly flow calculation	**Job No:**	**Calc. By:**
	Drg no:	**Chkd. By:**
		Recommended By:
		Approved By:

Month	Discharge (m3/s)	Month	Discharge (m3/s)
Baishakh	3.69	Baishakh	3.76
Jestha	6.38	Jestha	10.60
Ashadh	36.22	Ashar	39.79
Shrawan	75.01	Shrawan	73.81
Bhadra	75.34	Bhadra	77.18
Ashwin	43.92	Ashwin	48.85
Kartik	16.98	Kartik	19.93
Mangsir	9.07	Mangsir	9.05
Poush	6.66	Poush	6.32
Magh	5.72	Magh	5.32
Falgun	4.81	Falgun	4.64
Chaitra	4.00	Chaitra	3.98
Average	23.99	Average	25.27

Comparision of Mean Monthly Flow

Average Monthly Flow (1991-2022)
Average Montlhy Flow (1975-1991)

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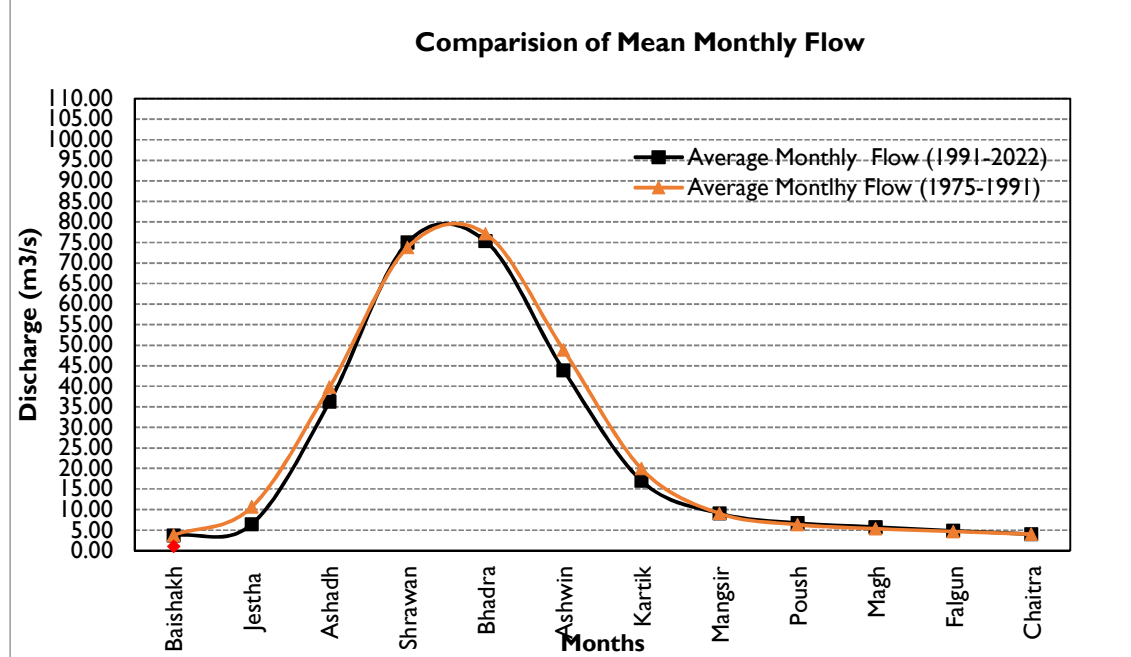
CALCULATION FORM

Job:	**Jhimruk khola**	**Date:**	**Page**	
Subject:	**FDC of Jhimruk**	**Job No:**	**Calc. By:**	
		Drg no:	**Chkd. By:**	
			Recommended By:	
			Approved By:	

% Exceedence	Discharge, m3/s
5	94.99
10	72.16
15	57.55
20	44.92
25	34.31
30	25.70
35	17.72
40	12.83
45	9.75
50	8.21
55	7.20
60	6.46
65	5.81
70	5.27
75	4.79
80	4.27
85	3.71
90	3.13
95	2.29

Flow Duration Curve

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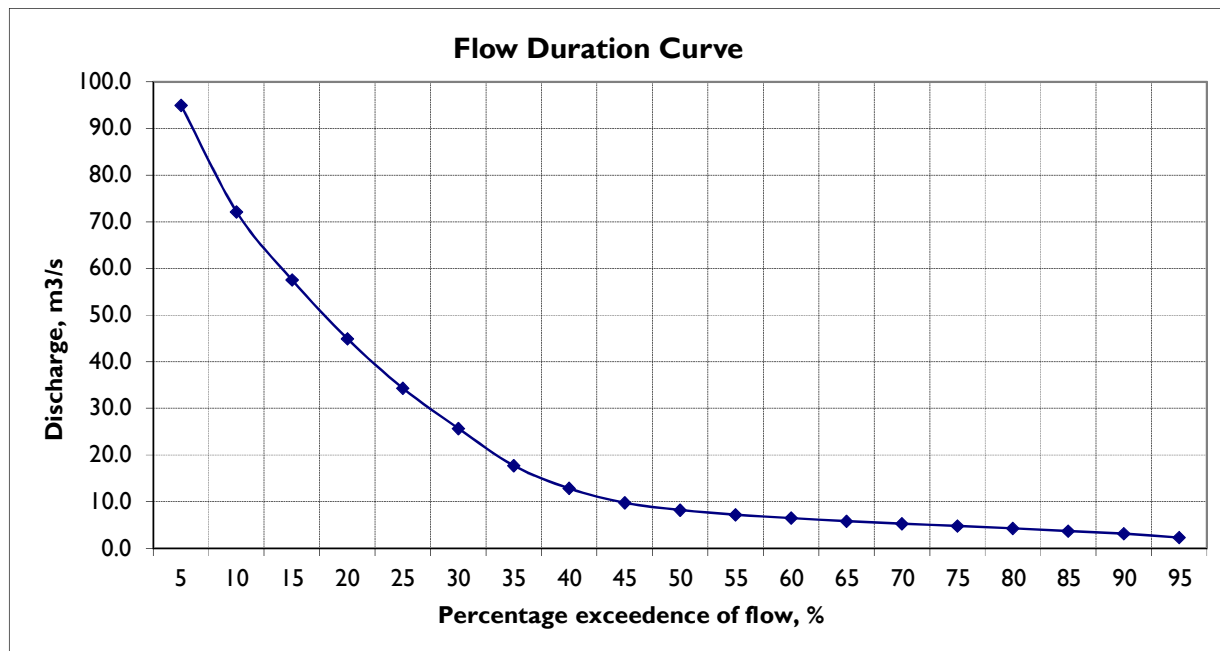
CALCULATION FORM

Job: **Jhimruk khola**   **Date:**   2/15/2023 **Page**

Subject: Low flow analysis   **Job No:**   **Calc. By:**

                                          Drg no: **Chkd. By:**

                                                                    Recommended By:

                                                                    Approved By:

Return period (T-	Minimum Daily flows, m^3/s			
	1-day	7-day	15-day	30-day
2	1.42	1.77	2.09	2.75
5	0.65	0.92	1.15	1.72
10	0.39	0.60	0.78	1.26
20	0.24	0.39	0.53	0.93
50	0.12	0.23	0.33	0.63
100	0.08	0.15	0.23	0.47

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E N G I N E E R I N G

CALCULATION FORM

Job: **Date:** 2/15/2023 **Page**

Subject: Flood Frequency Analysi **Job No:** **Calc. By:**

Drg no: **Chkd. By:**

Recommended By:

Approved By:

River: Refernce: Applied Hydrology by VT Chow

Station No.

Location:

Total Catchment 645.8 Km2

Area below 5000 7.7 Km2

Year	Maximum flow	
	X = Qi	y = log(x)
51/52	123	2.088597
52/53	119	2.07664
53/54	377	2.576307
54/55	538	2.730693
55/56	255	2.407221
56/57	232	2.366311
57/58	157	2.196618
58/59	163	2.213358
59/60	151	2.179149
60/61	255	2.406881
61/62	92	1.963882
62/63	140	2.145342
63/64	91	1.957114
64/65	187	2.272422
65/66	236	2.373464
66/67	129	2.111699
67/68	242	2.383923
68/69	151	2.177715
69/70	220	2.341514
70/71	212	2.327083
71/72	116	2.063799
72/73	187	2.271333
73/74	528	2.72261
74/75	164	2.214099
75/76	176	2.245453
76/77	132	2.121934

CALCULATION FORM

Job:	Date: 2/15/2023	Page
Subject: Flood Frequency Analysis	Job No:	Calc. By:
	Drg no:	Chkd. By:
		Recommended By:
		Approved By:

77/78	160	2.203944
78/79	190	2.279699
79/80	272	2.434586

Statistical Parameter

Mean	206.8	2.271	y_{mean}
Std. Devia	109.6	0.191	s
Coef Skev	2.0	0.761	C_s

Statistical Analiysis

Return Period	Parameters		Jhimruk							
			Log normal			Log Pearsion III			Gumbel	
	p	w	z	X_T	X	K_T	X_T	X	yT	xT
1	1.000	0.000	-2.516	1.791	**61.8**	-1.771	1.933	**86**		
2	0.500	1.177	0.000	2.271	**186.6**	-0.040	2.263	**183**	0.37	**189**
2.33	0.429	1.301	0.178	2.305	**201.7**	0.137	2.297	**198**	0.58	**207**
5	0.200	1.794	0.841	2.431	**269.9**	0.866	2.436	**273**	1.50	**286**
10	0.100	2.146	1.282	2.515	**327.4**	1.417	2.541	**348**	2.25	**350**
20	0.050	2.448	1.645	2.584	**384.1**	1.915	2.636	**432**	2.97	**411**
50	0.020	2.797	2.054	2.662	**459.6**	2.522	2.752	**564**	3.90	**491**
100	0.010	3.035	2.327	2.714	**518.0**	2.956	2.834	**683**	4.60	**550**
200	0.005	3.255	2.576	2.762	**577.9**	3.374	2.914	**820**	5.30	**610**
500	0.002	3.526	2.879	2.820	**659.9**	3.909	3.016	**1037**	6.21	**688**
1000	0.001	3.717	3.091	2.860	**724.3**	4.302	3.091	**1233**	6.91	**747**

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CALCULATION FORM

Job: **Page**
Subject: Trend Analysis **Date:** 2/15/2023 **Calc. By:**
Job No: **Chkd. By:**
Drg no: **Recommended By:**
Approved By:

		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
		24.0324	27.6253	28.28619	33.70	29.66491	34.95715	28.2489	19.68926	39.70421	16.23511	21.89011	17.54133
1995	24.0324		I	I	I	I	I	I	-I	I	-I	-I	-I
1996	27.6253			I	I	I	I	I	-I	I	-I	-I	-I
1997	28.28619				I	I	I	-I	-I	I	-I	-I	-I
1998	33.69624					-I	I	-I	-I	I	-I	-I	-I
1999	29.66491						I	-I	-I	I	-I	-I	-I
2000	34.95715							-I	-I	I	-I	-I	-I
2001	28.2489								-I	I	-I	-I	-I
2002	19.68926									I	-I	I	-I
2003	39.70421										-I	-I	-I
2004	16.23511											I	I
2005	21.89011												-I
2006	17.54133												
2007	23.24371												
2008	24.1937												
2009	21.10402												
2010	23.1869												
2011	23.62413												
2012	19.85899												
2013	29.98054												
2014	20.55781												

Butwal Power Company Ltd.

HYDRO-CONSULT
E N G I N E E R I N G

CALCULATION FORM   Date: 2/15/2023   Page

Job: **Job No:**   **Calc. By:**

Subject: Trend Analysis   **Drg no:**   **Chkd. By:**

Recommended By:

Approved By:

2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
23.24371	24.1937	21.10402	23.1869	23.62413	19.85899	29.98	20.55781	19.73937	28.33259	23.42463	15.85299	18.27255	30.5202	30.95216	25.30703
-I	I	-I	-I	-I	-I	I	-I	-I	I	-I	-I	-I	I	I	I
-I	-I	-I	-I	-I	-I	I	-I	-I	I	-I	-I	-I	I	I	-I
-I	-I	-I	-I	-I	-I	I	-I	-I	I	-I	-I	-I	I	I	-I
-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I
-I	-I	-I	-I	-I	-I	I	-I	-I	-I	-I	-I	-I	I	I	-I
-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I
-I	-I	-I	-I	-I	-I	I	-I	-I	I	-I	-I	-I	I	I	-I
I	I	I	I	I	I	I	I	I	I	I	I	-I	-I	I	I
-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I	-I
I	I	I	I	I	I	I	I	I	I	I	-I	I	I	I	I
I	I	-I	I	I	-I	I	-I	-I	I	I	-I	-I	I	I	I
I	I	I	I	I	I	I	I	I	I	I	-I	I	I	I	I
	I	-I	-I	I	-I	I	-I	-I	I	I	-I	-I	I	I	I
		-I	-I	-I	-I	I	-I	-I	I	-I	-I	-I	I	I	I
				I	I	-I	I	-I	-I	I	I	-I	-I	I	I	I
					I	-I	I	-I	-I	I	I	-I	-I	I	I	I
						-I	I	-I	-I	I	-I	-I	-I	I	I	I
							I	-I	-I	I	I	-I	-I	I	I	I
								-I	-I	-I	-I	-I	-I	I	I	-I
									-I	I	I	-I	-I	I	I	I

HYDRO-CONSULT
E N G I N E E R I N G

CALCULATION FORM

Job: **Page**
Subject: Trend Analysis   **Date:**   2/15/2023   **Calc. By:**
                                        Job No: **Chkd. By:**
                                        Drg no: **Recommended By:**
                                                                         Approved By:

		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
		24.0324	27.6253	28.28619	33.70	29.66491	34.95715	28.2489	19.68926	39.70421	16.23511	21.89011	17.54133
2015	19.73937												
2016	28.33259												
2017	23.42463												
2018	15.85299												
2019	18.27255												
2020	30.5202												
2021	30.95216												
2022	25.30703												

	prel	0	0	0	0	0	0	0	0	0	0	0	0
	ties	0	0	0	0	0	0	0	0	0	0	0	0
	freq	0	0	0	0	0	0	0	0	0	0	0	0

0

Result

n	28
alpha	0.05
MK-stat	-44
s.e.	50.6162
Z-stat	-0.84953
p-value	0.395586
trend	Thre is no significant trend

HYDRO-CONSULT
ENGINEERING

CALCULATION FORM   Date: 2/15/2023   **Page**

Job: **Job No:**   **Calc. By:**

Subject: Trend Analysis   **Drg no:**   **Chkd. By:**

Recommended By:

Approved By:

2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
23.24371	24.1937	21.10402	23.1869	23.62413	19.85899	29.98	20.55781	19.73937	28.33259	23.42463	15.85299	18.27255	30.5202	30.95216	25.30703
								0	1	1	-1	-1	1	1	1
									0	-1	-1	-1	1	1	-1
										0	-1	-1	1	1	1
											0	1	1	1	1
												0	1	1	1
													0	1	-1
														0	-1
															0

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HYDRO-CONSULT
ENGINEERING

CALCULATION FORM   **Date:**   **2/15/2023**

Job: **Job No:**   **Page**

Subject: **Trend Analysis**   **Drg no:**   **Calc. By:**

    Chkd. By:

    Recommende

    Approved By:

Description/Data Series	Man-Kendall's statistical value	Man-Kendall's tau	Man-Kendall's P-value	Apparent trend
Mean Annual Discharge	-64	-0.2133	0.1409	-0.1962
5-Years moving average	-16	-0.0533	0.7279	-0.2181
10-Years moving average	22	0.1158	0.4986	-0.1913
Baishakh	57	0.1624	0.2440	0.0447
Jestha	7	0.0215	0.8955	-0.0923
Ashadh	-56	-0.1481	0.2785	-0.1749
Shrawan	-54	-0.1429	0.2964	-0.6388
Bhadra	-120	-0.2956	0.02421 **	-0.9571
Ashwin	52	0.1281	0.3404	0.3175
Karkit	58	0.1432	0.3901	0.2515
Mangsir	-20	-0.0493	0.7231	0.0097
Poush	-42	-0.1114	0.4177	0.0006
Magh	-5	-0.0133	0.9370	0.0047
Falgun	-18	-0.0476	0.7385	-0.0092
Chaitra	2	0.0057	0.9834	-0.0066

HYDRO-CONSULT ENGINEERING

CALCULATION FORM

Job: **Date:** 2/15/2023   **Page**

Subject: Trend Analysis   **Job No:**   **Calc. By:**

     Drg no: **Chkd. By:**

Recommended By:

Approved By:

Year	Mean Annual Discharge	5-year moving	10-year moving average	Remark	Year	Annaul Discharge	Year	5-year moving average	Year	10-year moving average
51/52	17.8			Irrigation	51/52		55/56	25.8	60/61	27.6
52/53	20.2				52/53	20.16	56/57	28.9	61/62	27.4
53/54	29.3				53/54	29.27	57/58	31.2	62/63	27.7
54/55	30.6				54/55	30.64	58/59	30.7	63/64	26.4
55/56	31.1	25.8			55/56	31.13	59/60	30.2	64/65	25.8
56/57	33.1	28.9			56/57	33.05	60/61	29.4	65/66	24.9
57/58	32.1	31.2			57/58	32.06	61/62	26.0	66/67	23.7
58/59	26.8	30.7			58/59	26.76	62/63	24.2	67/68	23.0
59/60	28.0	30.2		hw meainte	59/60		63/64	22.0	68/69	22.5
60/61	27.2	29.4	27.6		60/61	27.17	64/65	21.5	69/70	22.2
61/62	16.0	26.0	27.4	Jestha NA	61/62		65/66	20.4	70/71	22.0
62/63	23.2	24.2	27.7		62/63	23.25	66/67	21.4	71/72	22.5
63/64	15.7	22.0	26.4		63/64	15.7	67/68	21.8	72/73	22.3
64/65	25.3	21.5	25.8		64/65	25.31	68/69	23.0	73/74	23.7
65/66	21.5	20.4	24.9		65/66	21.53	69/70	23.0	74/75	23.1
66/67	21.3	21.4	23.7		66/67	21.34	70/71	23.7	75/76	22.6
67/68	25.1	21.8	23.0		67/68	25.06	71/72	23.6	76/77	22.9
68/69	21.8	23.0	22.5		68/69	21.77	72/73	22.8	77/78	23.2
69/70	25.1	23.0	22.2		69/70	25.13	73/74	24.5	78/79	24.0
70/71	25.3	23.7	22.0		70/71	25.27	74/75	23.2	79/80	26.1
71/72	20.6	23.6	22.5		71/72	20.6	75/76	21.4		
72/73	21.5	22.8	22.3		72/73	21.47	76/77	22.2		
73/74	29.8	24.5	23.7		73/74	29.8	77/78	23.6		
74/75	18.8	23.2	23.1		74/75	18.82	78/79	23.5		
75/76	16.5	21.4	22.6		75/76	16.5	79/80	29.0		
76/77	24.3	22.2	22.9		76/77	24.33				
77/78	28.3	23.6	23.2		77/78	28.34				
78/79	29.4	23.5	24.0		78/79	29.43				
79/80	46.6	29.0	26.1	incomplete	79/80					

Mean Annaul Discharge

File: 'D:\...........'Mean_Annaul_Nepali_Months.txt'

HYDRO-CONSULT
E N G I N E E R I N G

CALCULATION FORM

Job:	**Date:** 2/15/2023	**Page**
Subject: Trend Analysis	**Job No:**	**Calc. By:**
	Drg no:	**Chkd. By:**
		Recommended By:
		Approved By:

Statistics : Start = 2052 End = 2078 Length = 25

Mean	SD	Skew	SE	CV
24.96	4.811	-0.1222	0.9623	0.1928

Summary : Start = 2052 End = 2078 Length = 25

Min	Q1	Median	Q3	Max
15.70	21.44	25.13	29.31	33.05

Persistence test :
    Series Start = 2052 End = 2078 Length = 25

    Null hypothesis: There is no lag-1 persistence in the series

    $r(1) = 0.395$

Alpha	0.10	0.05	0.02	0.01
UCL	0.329	0.392	0.465	0.515
LCL	-0.329	-0.392	-0.465	-0.515

Mann-Kendall trend test :
    Series Start = 2052 End = 2078 Length = 25

    Null hypothesis: There is no trend in the series

    S =   -64
    tau = -0.2133
    p =   0.1409
    Since P>0.01, no significant trend
Apparent trend : Start = 2052 End = 2078 Length = 25

	Estimate	SE	t-stat	Pr(>|t|)
Const	27.31	1.820	15.00	<0.0001 ***

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ENGINEERING

CALCULATION FORM

Job:	**Date:**	**2/15/2023**	**Page**
Subject: Trend Analysis	**Job No:**		**Calc. By:**
	Drg no:		**Chkd. By:**
			Recommended By:
			Approved By:

Slope   -0.1962   0.1300   -1.509   0.1449

Residual SE: 4.688   Regression DF: 23
R-squared: 0.09007   Adj R-squared: 0.05051

5-year moving average
File: 'D:\.....'Jhimruk_mean_annual_5-year_moving_average.txt'

Statistics : Start = 2055 End = 2079 Length = 25

Mean	SD	Skew	SE	CV
24.68	3.284	0.7499	0.6568	0.1331

Summary : Start = 2055 End = 2079 Length = 25

Min	Q1	Median	Q3	Max
20.40	22.15	23.60	26.73	31.20

Persistence test :
   Series Start = 2055 End = 2079 Length = 25

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1) = 0.804$

Alpha	0.10	0.05	0.02	0.01
UCL	0.329	0.392	0.465	0.515
LCL	-0.329	-0.392	-0.465	-0.515

Persistence test (pre-white) :
   Series Start = 2055 End = 2079 Length = 25

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1) = 0.285$

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E N G I N E E R I N G

CALCULATION FORM

Job:	**Date:** 2/15/2023	**Page**	
Subject: Trend Analysis	**Job No:**	**Calc. By:**	
	Drg no:	**Chkd. By:**	
		Recommended By:	
		Approved By:	

```
  Alpha    0.10   0.05   0.02   0.01
  UCL     0.329  0.392  0.465  0.515
  LCL    -0.329 -0.392 -0.465 -0.515
```

Mann-Kendall trend test (pre-white) :

   Series Start = 2055 End = 2079 Length = 25

   Null hypothesis: There is no trend in the series

   S =   -16

   tau = -0.05333

   p =   0.7279

Since P>0.01, no significant trend

Apparent trend : Start = 2055 End = 2079 Length = 25

```
           Estimate      SE    t-stat   Pr(>|t|)
  Const     27.30      1.136   24.02   <0.0001 ***
  Slope    -0.2181    0.08118  -2.686   0.01318 **
```

   Residual SE: 2.927   Regression DF: 23

   R-squared: 0.2388   Adj R-squared: 0.2057

10-year moving average

File: 'D:\....'Jhimruk_mean_annual_10-year_moving_average .txt'

Statistics : Start = 2060 End = 2079 Length = 20

```
  Mean     SD    Skew     SE      CV
  24.18   1.950  0.6430  0.4359  0.08063
```

Summary : Start = 2060 End = 2079 Length = 20

```
   Min     Q1   Median    Q3     Max
  22.00   22.55  23.45   25.95   27.70
```

HYDRO-CONSULT
E N G I N E E R I N G

CALCULATION FORM

Job:	**Date:** 2/15/2023	**Page**
Subject: Trend Analysis	**Job No:**	**Calc. By:**
	Drg no:	**Chkd. By:**
		Recommended By:
		Approved By:

Persistence test :
Series Start = 2060 End = 2079 Length = 20

Null hypothesis: There is no lag-1 persistence in the series

r(1) = 0.801

Alpha   0.10   0.05   0.02   0.01
UCL   0.368   0.438   0.520   0.576
LCL   -0.368 -0.438 -0.520 -0.576

Persistence test (pre-white) :
Series Start = 2060 End = 2079 Length = 20

Null hypothesis: There is no lag-1 persistence in the series

r(1) = 0.285

Alpha   0.10   0.05   0.02   0.01
UCL   0.368   0.438   0.520   0.576
LCL   -0.368 -0.438 -0.520 -0.576

Mann-Kendall trend test (pre-white) :
Series Start = 2060 End = 2079 Length = 20

Null hypothesis: There is no trend in the series

S   =   22
tau =   0.1158
p   =   0.4986
Since P>0.01, no significant trend
Apparent trend : Start = 2060 End = 2079 Length = 20

        Estimate   SE   t-stat Pr(>|t|)

CALCULATION FORM

Job:	**Date:** 2/15/2023 **Page**
Subject: Trend Analysis	**Job No:** **Calc. By:**
	Drg no: **Chkd. By:**
	Recommended By:
	Approved By:

```
Const    26.00    0.7029    36.99   <0.0001 ***
Slope   -0.1913   0.06325   -3.024  0.007289 ***


Residual SE:   1.631    Regression DF: 18
R-squared:     0.3369   Adj R-squared: 0.3001
```

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E N G I N E E R I N G

CALCULATION FORM

Job:

Subject: Trend Analysis

Date: 2/15/2023

Job No:

Drg no:

Page

Calc. By:

Chkd. By:

Recommended By:

Approved By:

Years	Baishakh
2051	
2052	2.25
2053	2.09
2054	3.94
2055	4.64
2056	2.32
2057	5.43
2058	5.32
2059	6.09
2061	2.93
2062	2.43
2063	4.68
2064	3.81
2065	2.77
2066	1.64
2067	1.90
2068	2.61
2069	2.07
2070	3.33
2071	2.42
2072	4.77
2073	2.57
2074	5.09
2075	2.67
2076	2.86
2077	8.25
2078	5.31
2079	5.46

Open a time series file to start

File: 'D:\..01baisakh.txt'

Persistence test :
   Series Start = 2052 End = 2079 Length = 27

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1) = 0.221$
   Alpha   0.10   0.05   0.02   0.01
   UCL   0.317   0.377   0.448   0.496
   LCL   -0.317 -0.377 -0.448 -0.496

Mann-Kendall trend test :
   Series Start = 2052 End = 2079 Length = 27

   Null hypothesis: There is no trend in the series

   S   =   57
   tau =   0.1624
   p   =   0.2440
Since P>0.01, no significant trend
Apparent trend : Start = 2052 End = 2079 Length = 27

       Estimate   SE   t-stat Pr(>|t|)
   Const   3.110   0.6050   5.141   <0.0001 ***
   Slope   0.04468   0.03992   1.119   0.2736

   Residual SE: 1.616   Regression DF: 25
   R-squared: 0.04772   Adj R-squared: 0.009632

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E N G I N E E R I N G

CALCULATION FORM

Job:

Subject: Trend Analysis

Date: 2/15/2023

Job No:

Drg no:

Page

Calc. By:

Chkd. By:

Recommended By:

Approved By:

	Jestha
2051	
2052	
2053	2.82
2054	3.19
2055	3.98
2056	9.95
2057	25.83
2058	10.67
2059	5.89
2060	
2061	4.49
2062	1.83
2063	11.04
2064	4.02
2065	6.78
2066	4.99
2067	2.62
2068	5.58
2069	1.55
2070	11.67
2071	3.77
2072	2.60
2073	5.44
2074	6.34
2075	3.54
2076	3.17
2077	8.83
2078	8.05
2079	7.31

File: 'D:\...\02jeth.txt'

Persistence test :

   Series Start = 2053 End = 2079 Length = 26

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1) = 0.214$

   Alpha   0.10   0.05   0.02   0.01
   UCL   0.323   0.384   0.456   0.505
   LCL   -0.323 -0.384 -0.456 -0.505

Mann-Kendall trend test :

   Series Start = 2053 End = 2079 Length = 26

   Null hypothesis: There is no trend in the series

   $S = 7$

   $tau = 0.02154$

   $p = 0.8955$

Since P>0.01, no significant trend

Apparent trend : Start = 2053 End = 2079 Length = 26

	Estimate	SE	t-stat	Pr(>|t|)	
Const	7.536	1.899	3.969	0.0005703	***
Slope	-0.09228	0.1303	-0.7084	0.4855	

Residual SE: 4.982   Regression DF: 24

R-squared: 0.02048   Adj R-squared: -0.02033

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E N G I N E E R I N G

CALCULATION FORM

Job:

Subject: **Trend Analysis**

Date: **2/15/2023**

Job No:

Drg no:

Page

Calc. By:

Chkd. By:

Recommended By:

Approved By:

	Ashadh
2051	
2052	43.02
2053	28.79
2054	46.51
2055	68.41
2056	38.92
2057	57.25
2058	39.45
2059	23.50
2060	45.84
2061	24.20
2062	19.97
2063	33.47
2064	19.37
2065	41.60
2066	14.92
2067	19.00
2068	36.65
2069	19.60
2070	70.99
2071	20.76
2072	18.77
2073	44.83
2074	55.60
2075	9.41
2076	14.81
2077	73.22
2078	56.02
2079	29.32

File: 'D:\....s\03asar.txt'

Persistence test :
   Series Start = 2052 End = 2079 Length = 28

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1) = -0.045$

   Alpha   0.10   0.05   0.02   0.01
   UCL   0.311   0.370 0.440 0.487
   LCL   -0.311 -0.370 -0.440 -0.487

Mann-Kendall trend test :
   Series Start = 2052 End = 2079 Length = 28

   Null hypothesis: There is no trend in the series

   S =   -56
   tau = -0.1481
   p   =   0.2785
Since P>0.01, no significant trend
Apparent trend : Start = 2052 End = 2079 Length = 28

	Estimate	SE	t-stat	Pr(>|t|)	
Const	38.58	6.789	5.683	<0.0001	***
Slope	-0.1749	0.4315	-0.4054	0.6885	

   Residual SE: 18.44   Regression DF: 26
   R-squared: 0.006281   Adj R-squared: -0.03194

HYDRO-CONSULT
E N G I N E E R I N G

CALCULATION FORM

Job:	**Date:** 2/15/2023
Subject: Trend Analysis	**Job No:**
	Drg no:

Page
Calc. By:
Chkd. By:
Recommended By:
Approved By:

	Shrawan
2051	
2052	65.77
2053	97.31
2054	125.20
2055	96.43
2056	60.75
2057	90.97
2058	81.16
2059	55.83
2060	94.43
2061	50.57
2062	61.74
2063	53.57
2064	68.52
2065	67.09
2066	71.93
2067	74.61
2068	68.27
2069	64.82
2070	110.65
2071	73.94
2072	67.39
2073	130.71
2074	68.64
2075	48.65
2076	41.23
2077	83.26
2078	73.54
2079	53.42

File: 'D:\Andhi Khola and Jhimruk\Dscreen\average flows\04shrawann.tx

Persistence test :
  Series Start = 2052 End = 2079 Length = 28

  Null hypothesis: There is no lag-1 persistence in the series

  $r(1) = 0.085$

  Alpha   0.10   0.05   0.02   0.01
  UCL   0.311   0.370   0.440   0.487
  LCL   -0.311 -0.370 -0.440 -0.487

Mann-Kendall trend test :
  Series Start = 2052 End = 2079 Length = 28

  Null hypothesis: There is no trend in the series

  $S = -54$
  $tau = -0.1429$
  $p = 0.2964$
Since P>0.01, no significant trend
Apparent trend : Start = 2052 End = 2079 Length = 28

      Estimate   SE   t-stat Pr(>|t|)
  Const   83.64   8.037   10.41   <0.0001 ***
  Slope   -0.6388   0.5109 -1.250   0.2223

  Residual SE: 21.84   Regression DF: 26
  R-squared: 0.05672   Adj R-squared: 0.02044

HYDRO-CONSULT
E N G I N E E R I N G

CALCULATION FORM

Job:

!Trend Analysis

Date: 2/15/2023

Job No:

Drg no:

Page

Calc. By:

Chkd. By:

Recommended By:

Approved By:

Bhadra	5-year moving average
66.04	
69.93	
92.85	
70.75	
123.97	84.71
110.91	93.68
117.17	103.13
113.74	107.31
65.02	106.16
92.61	99.89
34.17	84.54
83.78	77.86
40.97	63.31
90.88	68.48
66.96	63.35
68.34	70.18
74.60	68.35
70.30	74.21
65.48	69.13
76.76	71.09
59.78	69.38
58.64	66.19
44.64	61.06
57.67	59.50
64.63	57.07
63.80	57.87
81.71	62.49
104.51	74.46
54.42	73.81

File: 'D:\...\05bhadra.txt'

Persistence test :

   Series Start = 2051 End = 2079 Length = 29

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1) = 0.214$

   Alpha   0.10   0.05   0.02   0.01
   UCL   0.305 0.364 0.432 0.478
   LCL -0.305 -0.364 -0.432 -0.478

Mann-Kendall trend test :

   Series Start = 2051 End = 2079 Length = 29

   Null hypothesis: There is no trend in the series

   $S = -120$

   $tau = -0.2956$

   $p = 0.02421$ **

Since P>0.01, no significant trend

Apparent trend : Start = 2051 End = 2079 Length = 29

	Estimate	SE	t-stat	Pr(>|t|)	
Const	88.75	7.829	11.34	<0.0001	***
Slope	-0.9571	0.4800	-1.994	0.05635	*

Residual SE: 21.63   Regression DF: 27

R-squared: 0.1283   Adj R-squared: 0.09607

HYDRO-CONSULT ENGINEERING

CALCULATION FORM

Job:

Subject: **Trend Analysis**

Date: 2/15/2023

Job No:

Drg no:

Page

Calc. By:

Chkd. By:

Recommended By:

Approved By:

	Ashwin
2051	30.03
2052	26.75
2053	50.07
2054	34.59
2055	45.18
2056	73.76
2057	64.71
2058	35.92
2059	30.40
2060	55.66
2061	31.65
2062	33.34
2063	26.49
2064	40.89
2065	57.39
2066	40.60
2067	55.24
2068	50.33
2069	39.76
2070	30.81
2071	34.14
2072	35.21
2073	54.54
2074	39.64
2075	23.31
2076	47.03
2077	56.91
2078	45.67
2079	83.81

File: 'D:\...\06asoj.txt'

Persistence test :

   Series Start = 2051 End = 2079 Length = 29

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1) = 0.158$

Alpha	0.10	0.05	0.02	0.01
UCL	0.305	0.364	0.432	0.478
LCL	-0.305	-0.364	-0.432	-0.478

Mann-Kendall trend test :

   Series Start = 2051 End = 2079 Length = 29

   Null hypothesis: There is no trend in the series

   $S = 52$

   $tau = 0.1281$

   $p = 0.3404$

Since P>0.01, no significant trend

Apparent trend : Start = 2051 End = 2079 Length = 29

	Estimate	SE	t-stat	Pr(>|t|)	
Const	39.48	5.279	7.478	<0.0001	***
Slope	0.3175	0.3237	0.9808	0.3354	

Residual SE: 14.58 Regression DF: 27

R-squared: 0.03440 Adj R-squared: -0.001361

HYDRO-CONSULT
E N G I N E E R I N G

CALCULATION FORM

Job: **Date:**   2/15/2023   **Page**
Subject: Trend Analysis   **Job No:**   **Calc. By:**
                                              Drg no: **Chkd. By:**
                                                                                      Recommended By:
                                                                                      Approved By:

	Kartik
2051	10.83
2052	10.51
2053	20.31
2054	14.88
2055	18.23
2056	20.94
2057	17.11
2058	15.04
2059	13.66
2060	15.02
2061	14.04
2062	17.11
2063	10.40
2064	17.22
2065	16.36
2066	18.74
2067	17.75
2068	16.41
2069	13.72
2070	18.60
2071	16.52
2072	12.89
2073	22.45
2074	13.72
2075	10.55
2076	15.20
2077	16.99
2078	39.52
2079	27.69

File: 'D:\...\07kartik.txt'

Persistence test :

   Series Start = 2051 End = 2079 Length = 29

   Null hypothesis: There is no lag-1 persistence in the ser

   $r(1) = 0.282$

   Alpha   0.10   0.05   0.02   0.01
   UCL   0.305   0.364   0.432   0.478
   LCL   -0.305 -0.364 -0.432 -0.478

Mann-Kendall trend test :

   Series Start = 2051 End = 2079 Length = 29

   Data contain ties: using z-score

   Null hypothesis: There is no trend in the series

   S   =   58
   tau =   0.1432
   SD =   53.29
   z   =   1.070
   p   =   0.2848

Since P>0.01, no significant trend

Apparent trend : Start = 2051 End = 2079 Length = 29

	Estimate	SE	t-stat	Pr(>|t|)	
Const	13.46	1.967	6.843	<0.0001	***
Slope	0.2515	0.1206	2.086	0.04656	**

Residual SE: 5.433   Regression DF: 27
R-squared: 0.1388   Adj R-squared: 0.1069

HYDRO-CONSULT
E N G I N E E R I N G

CALCULATION FORM

Job:

Subject: Trend Analysis

Date: 2/15/2023

Job No:

Drg no:

Page

Calc. By:

Chkd. By:

Recommended By:

Approved By:

	Mangsir
2051	7.51
2052	8.21
2053	9.50
2054	11.49
2055	11.39
2056	10.40
2057	10.14
2058	8.67
2059	7.10
2060	8.68
2061	8.07
2062	9.25
2063	7.28
2064	9.45
2065	8.39
2066	8.82
2067	9.32
2068	8.61
2069	7.64
2070	9.77
2071	9.06
2072	7.89
2073	10.11
2074	7.65
2075	6.66
2076	8.14
2077	8.42
2078	14.68
2079	10.80

File: 'D:\Andhi Khola and Jhimruk\Dscreen\average flows\08mangsr.txt'

Persistence test :
   Series Start = 2051 End = 2079 Length = 29

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1) = 0.285$

   Alpha   0.10   0.05   0.02   0.01
   UCL   0.305 0.364 0.432 0.478
   LCL   -0.305 -0.364 -0.432 -0.478

Mann-Kendall trend test :
   Series Start = 2051 End = 2079 Length = 29

   Null hypothesis: There is no trend in the series

   S =   -20
   tau = -0.04926
   p =   0.7231
Since P>0.01, no significant trend

Apparent trend : Start = 2051 End = 2079 Length = 29

      Estimate   SE   t-stat Pr(>|t|)
   Const   8.937   0.6044   14.79   <0.0001 ***
   Slope 0.009670 0.03706   0.2609   0.7961

   Residual SE: 1.670   Regression DF: 27
   R-squared: 0.002515   Adj R-squared: -0.03443

HYDRO-CONSULT ENGINEERING

CALCULATION FORM

Job: **Date:**   2/15/2023   **Page**

Subject: **Trend Analysis**   **Job No:**   **Calc. By:**

                            Drg no: **Chkd. By:**

                                                Recommended By:

                                                Approved By:

	Poush
2051	6.15
2052	6.12
2053	6.95
2054	8.04
2055	7.08
2056	7.57
2057	7.34
2058	6.71
2059	4.60
2060	7.22
2061	6.37
2062	6.38
2063	5.70
2064	6.83
2065	6.32
2066	6.73
2067	6.61
2068	6.89
2069	5.77
2070	7.13
2071	8.26
2072	5.91
2073	6.97
2074	5.69
2075	5.32
2076	6.32
2077	6.12
2078	9.47
2079	

File: 'D:\...\09poush.txt'

Persistence test :
  Series Start = 2051 End = 2078 Length = 28

  Null hypothesis: There is no lag-1 persistence in the seri

  $r(1) = -0.015$

Alpha	0.10	0.05	0.02	0.01
UCL	0.311	0.370	0.440	0.487
LCL	-0.311	-0.370	-0.440	-0.487

Mann-Kendall trend test :
  Series Start = 2051 End = 2078 Length = 28

  Data contain ties: using z-score

  Null hypothesis: There is no trend in the series

  S =   -42
  tau = -0.1114
  SD =   50.60
  z = -0.8103
  p =   0.4177

Since P>0.01, no significant trend

Apparent trend : Start = 2051 End = 2078 Length = 28

	Estimate	SE	t-stat	Pr(>|t|)
Const	6.655	0.3618	18.39	<0.0001 ***
Slope	0.0006212	0.02300	0.02701	0.9787

Residual SE: 0.9831   Regression DF: 26
R-squared: 2.806e-05   Adj R-squared: -0.03843

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CALCULATION FORM

Job:	**Date:** 2/15/2023	**Page**	
Subject: Trend Analysis	**Job No:**	**Calc. By:**	
	Drg no:	**Chkd. By:**	
		Recommended By:	
		Approved By:	

	Magh
2051	4.67
2052	6.63
2053	6.31
2054	5.51
2055	5.73
2056	6.48
2057	6.05
2058	6.60
2059	4.42
2060	6.56
2061	6.18
2062	4.97
2063	4.63
2064	5.59
2065	4.71
2066	5.24
2067	5.04
2068	5.79
2069	5.63
2070	6.51
2071	6.06
2072	5.27
2073	5.79
2074	4.81
2075	6.12
2076	6.05
2077	4.81
2078	8.03
2079	

File: 'D:\....\10maghh.txt'

Persistence test :
   Series Start = 2051 End = 2078 Length = 28

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1)$ = -0.167

   Alpha 0.10   0.05   0.02   0.01
   UCL   0.311 0.370 0.440 0.487
   LCL -0.311 -0.370 -0.440 -0.487

Mann-Kendall trend test :
   Series Start = 2051 End = 2078 Length = 28

   Data contain ties: using z-score

   Null hypothesis: There is no trend in the series

   S =   -5
   tau = -0.01328
   SD =   50.59
   z = -0.07907
   p =   0.9370
Since P>0.01, no significant trend

Apparent trend : Start = 2051 End = 2078 Length = 28

	Estimate	SE	t-stat	Pr(>|t|)	
Const	5.657	0.3067	18.45	<0.0001	***
Slope	0.004737	0.01949	0.2430	0.8099	

   Residual SE: 0.8332   Regression DF: 26
   R-squared: 0.002266   Adj R-squared: -0.03611

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CALCULATION FORM

Job:	**Date:** 2/15/2023 **Page**
Subject: Trend Analysis	**Job No:** **Calc. By:**
	Drg no: **Chkd. By:**
	Recommended By:
	Approved By:

	Falgun
2051	4.37
2052	6.14
2053	4.40
2054	5.09
2055	4.51
2056	5.29
2057	5.31
2058	5.42
2059	5.40
2060	4.46
2061	4.63
2062	4.16
2063	5.73
2064	4.43
2065	3.77
2066	4.27
2067	4.39
2068	4.15
2069	4.84
2070	5.45
2071	5.64
2072	3.94
2073	4.81
2074	3.76
2075	5.50
2076	5.32
2077	3.78
2078	5.81
2079	

File: 'D:\....\11falgun.txt'

Persistence test :

   Series Start = 2051 End = 2078 Length = 28

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1) = -0.172$

   Alpha   0.10   0.05   0.02   0.01
   UCL   0.311 0.370 0.440 0.487
   LCL   -0.311 -0.370 -0.440 -0.487

Mann-Kendall trend test :

   Series Start = 2051 End = 2078 Length = 28

   Null hypothesis: There is no trend in the series

   S   =   -18
   tau = -0.04762
   p   =   0.7385

Since P>0.01, no significant trend

Apparent trend : Start = 2051 End = 2078 Length = 28

     Estimate   SE   t-stat Pr(>|t|)
   Const   4.938   0.2568   19.23   <0.0001 ***
   Slope -0.009231 0.01632 -0.5656   0.5765

   Residual SE: 0.6976   Regression DF: 26
   R-squared: 0.01215   Adj R-squared: -0.02584

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CALCULATION FORM

Job:

Subject: Trend Analysis

Date: 2/15/2023

Job No:

Drg no:

Page

Calc. By:

Chkd. By:

Recommended By:

Approved By:

	Chaitra
2051	2.81
2052	3.85
2053	4.49
2054	5.10
2055	3.78
2056	3.97
2057	4.12
2058	6.75
2060	4.22
2061	3.69
2062	3.71
2063	3.90
2064	3.97
2065	3.16
2066	3.12
2067	3.47
2068	3.66
2069	3.01
2070	3.96
2071	5.09
2072	3.29
2073	4.19
2074	4.20
2075	4.27
2076	4.90
2077	3.09
2078	4.21
2079	

File: 'D:\...\12chaitra.txt'

Persistence test :

   Series Start = 2051 End = 2078 Length = 27

   Null hypothesis: There is no lag-1 persistence in the series

   $r(1) = 0.091$

   Alpha   0.10   0.05   0.02   0.01
   UCL   0.317   0.377   0.448   0.496
   LCL   -0.317 -0.377 -0.448 -0.496

Mann-Kendall trend test :

   Series Start = 2051 End = 2078 Length = 27

   Data contain ties: using z-score

   Null hypothesis: There is no trend in the series

   $S = 2$
   $tau = 0.005706$
   $SD = 47.96$
   $z = 0.02085$
   $p = 0.9834$

Since P>0.01, no significant trend

Apparent trend : Start = 2051 End = 2078 Length = 27

      Estimate   SE   t-stat $Pr(>|t|)$
  Const   4.085   0.3094   13.20   <0.0001 ***
  Slope -0.006606 0.02041 -0.3236   0.7489

   Residual SE: 0.8262   Regression DF: 25

R-squared: 0.004171   Adj R-squared: -0.03566