TABLE I

THE NUMBER OF EXCEEDANCES AT MATAKKA

days tex-ls. \ Years	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Total
Ist-July 16th July	0	2	0	0	0	0	0	0	1	0	0	2	0	2	0	0	2	0	0	0	0	0	1	1	1	1	0	0	0	3	16
h July- h July	2	2	3	0	1	0	0	0	2	0	1	3	1	1	0	0	1	1	1	1	0	0	0	2	0	1	0	1	1	0	25
st July- th Aug.	0	2	1	2	2	1	1	0	1	2	0	2	4	1	1	2	2	0	0	1	2	1	1	2	0	1	1	0	2	1	36
th Aug.- th Aug.	1	0	1	0	2	2	0	2	1	1	1	0	3	2	1	2	1	0	1	2	1	1	2	0	2	1	1	2	1	0	34
th Aug.- th Sept.	0	1	0	1	1	0	2	1	1	2	2	2	0	2	1	1	0	1	1	1	0	2	2	1	1	2	0	2	2	1	33
th Sept. th Sept.	0	2	2	0	0	0	3	0	0	1	1	1	0	2	0	1	1	0	0	2	2	1	0	0	0	1	0	0	1	1	22
th Sept- th Oct.	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4
th Oct.- th Oct.	0	2	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	2
otal	3	11	7	3	6	3	6	5	6	6	5	10	8	11	3	6	7	2	3	7	5	5	6	6	4	7	2	5	7	7	172

THE NUMBER OF EXCEEDANCES AT GHOSHWAR

15 days intervals / Years	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Total
1st July-15th July	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	1	1	0	0	0	0	1	0	2	1	0	1	0	2	12
16th July-30th July	1	1	2	1	1	1	0	0	1	0	1	1	1	1	1	0	0	1	0	1	0	1	0	2		1	0	1	1	0	21
31st July-14th Aug.	1	3	1	2	1	1	1	0	1	1	0	1	3	1	1	0	1	0	1	1	1	1	0	1	0	1	0	3	1	1	30
15th Aug.-29th Aug.	1	1	0	1	2	1	0	2	1	1	1	1	2	3	0	2	1	0	1	2	1	1	1	0	2	1	1	0	0	1	31
30th Aug.-13th Sept.	1	2	0	1	1	1	2	1	1	2	2	1	0	2	1	1	2	1	2	1	0	1	1	1	0	1	0	1	1	1	33
14th Sept.-28th Sept.	0	2	1	0	0	0	2	2	0	1	1	0	0	2	1	1	1	0	0	1	1	1	0	0	1	1	0	0	0	0	19
29th Sept.-13th Oct.	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4
14th Oct.-28th Oct.	0	0	0	0	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	1
Total	4	9	4	5	5	5	5	6	5	5	5	7	6	10	4	4	6	3	4	6	3	5	3	4	6	6	1	6	3	5	151

THE NUMBER OF SIMULTANEOUS EXCEEDANCES AT MURTAKKA AND GARDESHVAR

15 days inter-vals	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Total
1st July -15thJuly	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0	0	0	2	9
15th July -30thJuly	1	1	2	0	1	0	0	0	1	0	1	1	1	1	0	0	0	1	0	1	0	0	0	2	0	1	0	1	1	0	17
31st July -14thAug	0	2	1	2	1	1	1	0	1	1	0	1	3	1	1	0	1	0	0	1	1	1	0	1	0	1	0	0	0	1	23
15thAug -29thAug.	1	0	0	0	2	1	0	2	1	1	1	0	2	2	0	2	1	0	1	2	1	1	1	0	2	1	1	0	0	0	26
30th Aug -13thSept	0	1	0	1	1	0	2	1	1	1	2	1	0	2	1	1	0	1	1	1	0	1	1	1	1	1	0	1	1	1	27
14thSept -28thSept	0	2	0	0	0	0	2	0	0	1	1	0	0	2	0	1	1	0	0	1	1	1	0	0	0	1	0	0	0	0	14
29th Sept -13thOct	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
14th Oct -29thOct.	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
Total	2	6	3	3	5	2	5	4	5	5	5	5	6	9	2	4	4	2	2	6	3	4	3	4	4	6	1	2	2	4	118

THE MAGNITUDE OF EXCEEDANCES AT KURTAKKA

5 days Intervals / Years	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
t July - th July		100385 603022							295193			41533 751110		44364 169162
16th July- 30th July.	348525 234423	206967 506411	9804 76 656369		36636				83321 80381		15060	212522 231921 20514	26321	39446
21st July- 14th Aug.		231348 568983	281277	183321 163014	246838 367933	389918	107719		293033	38396 68724		116070 313687	68363 408332 25533 66087	159404
15th Aug.- 29th Aug.	611289		15105		64136 189265	230270 59032		132742 6591	200694	500965	95232		603303 21001 3759	21485 334052
30th Aug.- 13th Sept.		595869		30698	60158		84440 198914	537689	43651	45832 6503	101029 281303	257064 665229		17301 101699
14th Sept.- 28th Sept.		241383 226475	31185 211078				381448 564669 37269			69932	279977	468652		101699 165022
29th Sept.- 13th Oct.								193267 18687						112763
14th Oct.- 28th Oct.		53847 17603												

contd...

1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
		13439 126804						328597	146261	3107	173729				11786 32233 3894
		32586	369896	108596	204079				203546 219789		856552		19874	46210	
50494	159074 2802	48792 571750			225385	608982 63389	767814	77702	16621 19029		76094	54657		8793 285927	6849
34882	181205 62595	78334		560	165243 16429	446245	179339	172280 1216240		1463568 1170304	14855	974706	483331 331437	339507	
253132	315246		99675	15157	287092		2617 124499	287141 33143	464926	589308	1377058 532721		72354 880421	151150 200844	5636
	316468	19549			35312 40741	106836 21710	119319				42360			164636	69913
															240

THE MAGNITUDE OF EXCESS MORTALITY AT GARHWAR

Days Intervals / Years	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
1st July–15th July									280392			106496 359533		
16th July–30th July	436680	48772	22456 33617	145612	54489	54872			99184		1145	255255	26477	303961
31st July–14th Aug.	248986	74784 76602 36617	647702	20899 269916	283401	24861	67592		321940	41600		526976	460347 133660 75283	248410
15th Aug.–29th Aug.	205902	17740		17373	66698 173672	58921		213879 39914	217064	741790	82500	21544	547317 42688	44008 40817 508835
30th Aug.–13th Sept.	692556	145580 62009		39413	65856	6821	544270 197653	712471	73526	382157 66328	785580 613460	1205959		86099 44823
14th Sept.–28th Sept.		532164 20410	1228000				392689 205274	39079042		48588	211306			1534683 404824
29th Sept.–13th Oct.								362457				2252		238216
14th Oct.–28th Oct.						78289								

contd...

1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
		775959	237349					304747		20870 83642	350203		11776		113751 67185
49685			941237		270845		52318		203147 650466		779094		46844	95331	
33313		581071		309020	330103	189825	953936		256613		11000		528218 39287 31129	14821	722272
	258884 169621	210644		17109	26856 250221	372927	268126	199439		1543580 116838	154324	994372			
96230	342288	904582 578610	171074	4466 223982	305277		762531	2300838	471114		2014365		1040104	401403	654080
222357	388663	162847			106208	147985	192729			653832	225819				687064
										12871					

ABSTRACT

THEORY OF EXTREME VALUE AND ITS APPLICATION TO FLOOD CONTROL

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(An abstract of the thesis submitted in partial fulfilment of the requirements for the degree of Ph.D., Haryana Agricultural University, Hissar)

Distributions of extremes are useful for solving some of the important problems arising in the field of agricultural production with water-management engineering viz., extreme meteorological phenomena like, temperature, rainfall, runoff etc; breaking strength of materials; floods and droughts. In country like India the meteorological variables are of interest when they occur though at regular intervals but in a very erratic fashion. The present investigation is an attempt to develop suitable technique for dealing with data relating to the phenomenon of floods. These techniques will center around the three asymptotic distributions. Using the method of maximum likelihood the estimation of first two asymptotes has been made more efficient with the knowledge of maxima of samples. The likelihood estimation of parameters of bivariate distribution functions with Gumbel and Frechet distributions as marginals is not practical for estimation of the parameters. To overcome this difficult it is suggested that the estimates of the scale, location and shape parameters of components distributions can be obtained by observations on separate variables and consequently one can estimate the remaining dependence parameter assuming the other parameters to be known constants. These estimates alongwith their covariance matrix are derived when the marginals are I and II asymptotes of first and second largest values.

The applications of extreme value theory to the flood analysis are discussed. For this purpose the theoretical results on single variable due to Todorovic and his coworkers are extended to cover the two dimensional variables. The distribution function of the number of exceedances is found to be a bivariate poisson distribution with time dependent intensity function. The expected number of exceedances in a fixed time interval are expressed by a finite Fourier series. The bivariate distribution functions for supremum and infimum of the magnitude of exceedances in two variables have been obtained under the assumption that the number of exceedances and their magnitude are independent. The independence parameter of bivariate distribution function is estimated by relating it to the medial correlation coefficient. Finally the return period in bivariate case has been defined. For purpose of illustrations the data for waterdischarge on river Narmada at Mortakka and Gardeshwar is taken.