Rainfall Analysis for Modelling of IDF Curves for Bangalore Rural, Karnataka

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Abstract- Changes in the hydrologic cycle due to increase in greenhouse gases cause variations in intensity, duration, and frequency of precipitation events. Quantifying the potential effects of climate change and adapting to them is one way to reduce urban vulnerability. Since rainfall characteristics are often used to design water structures, reviewing and updating rainfall characteristics (i.e., Intensity–Duration–Frequency (IDF) curves) for future climate scenarios is necessary. The present study regards the evaluation of the IDF curves for Four raingauge stations of Bangalore rural : Anugondanahalli, Devanahally, Doddabalapura and Hoskote. Starting from daily rainfall observed data, to define the IDF curves and the extreme values in a smaller time window (2, 5, 10, 15, 30, 60, 120, 720, 1440 minutes), disaggregation techniques of the collected data have been used, in order to generate a synthetic sequence of rainfall, with statistical properties similar to the recorded data. Then, the rainfall pattern of the Four raingauge stations was analyzed and IDF curves were evaluated.

I. INTRODUCTION

Degradation of water quality, property damage and potential loss of life due to flooding is caused by extreme rainfall events. Historic rainfall event statistics (in terms of intensity, duration, and return period) are used to design flood protection structures, and many other civil engineering structures involving hydrologic flows. Since rainfall characteristics are often used to design water structures, reviewing and updating rainfall characteristics (i.e., Intensity–Duration–Frequency (IDF) curves) for future climate scenarios is necessary. A lot of studies, especially recently, have been developed to analyze the factors for assessment, adaptation and mitigation of climate change, and to enhance and sharpen the disaster management for the many and various stakeholders.

IDF stands for Intensity-Duration-Frequency. Rainfall intensity is defined as the ratio of the total amount of rain (rainfall depth) falling during a given period to the duration of the period It is expressed in depth units per unit time, usually as mm per hour . The period of time over which rainfall is measured is called duration. The number of times, during a specified period of years, that precipitation of a certain magnitude or greater occurs or will occur at a station is called frequency. (FAO, 2012).

The relation between rainfall and runoff is influenced by various storm and basin characteristics. Because of these complexities and the frequent paucity of adequate runoff data, many approximate formulae have been developed to relate rainfall and runoff. The earliest of these formulae were usually empirical statements.

Section I contains the IDF information, Section II contain the Study Area and methodology adopted, Section III contain the result and discussions, Section IV concludes research work with future directions.

II. MATERIALS AND METHODS

A. Study Area

The Study Area is located between Latitude 12º57′40.47′′ N to 13º29′30.3′′ N and 77º10′30.3′′ E to 77º57′22.9′′ E Longitude. The average mean daily temperature varies from 14 to 35^0C respectively. Four Raingauges Stations were considered as shown in Figure 1.
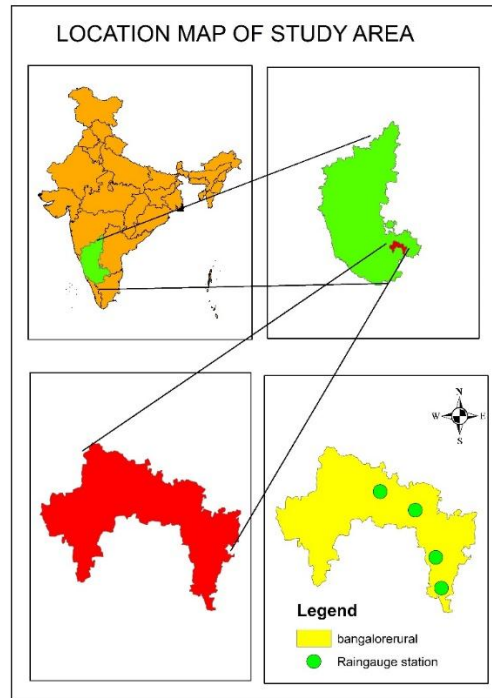
Figure 1 Location Map of Study Area

B. Methodology

Data collection – Daily rainfall data for stations for the years 1998 to 2016

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Estimation of Missing rainfall values by Normal Ratio Method) Px = 1/M [P1 + P2 + ….. + Pm]

↓

The maximum 24 hour rainfall data for each year was selected

↓

Maximum short duration rainfall for various return periods are calculated using Normal, Log normal Gumbels Distribution and Pearsons Type III

↓

The rainfall intensity I is obtained from the equation $I = \dfrac{P_t}{t_d}$

↓

IDF empirical equation used in the study is of the form $i = x * (t_d)^{-y}$

↓

Least square linear regression was applied to find the parameters x and y For the rainfall IDF empirical formula

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Derivation of Short Duration Empirical Reduction Formula

Figure 2 Methodology adopted for IDF curves

III. RESULTS AND DISCUSSIONS

A. Estimation of Short Duration Rainfall

Indian Meteorological Department (IMD) use an empirical reduction formula (Equation A) for estimation of various duration like 1-hr, 2-hr, 3-hr, 5-hr, 8-hr rainfall values from annual maximum values. Chowdhury et al. (2007), used IMD empirical reduction formula to estimate the short duration rainfall from daily rainfall data in Sylhet city and found that this formula give the best estimation of short duration rainfall. (Rashid et al, 2012)

$$P_t = P_{24} \left(\frac{t}{24}\right)^{\frac{1}{3}}$$

(equation A)

where, P_t is the required rainfall depth in mm at t-hr duration,

P_{24} is the daily rainfall in mm and t is the duration of rainfall for which the rainfall depth is required in hr.

Short duration rainfall by using IMD empirical formula for For various stations is tabulated in Table 1 to Table 4.

Table 1 Short duration rainfall for Anugondanahalli

Year	Rainfall (mm)	$P_t = P_{24} \left(\frac{t}{24}\right)^{\frac{1}{3}}$ in mm where, time t is in hours							
Duration in Minutes		**5**	**10**	**15**	**30**	**60**	**120**	**720**	**1440**
1998	128.80	19.50	24.57	28.13	35.44	44.65	56.26	102.23	128.80
1999	42.00	6.36	8.01	9.17	11.56	14.56	18.35	33.34	42.00
2000	103.40	15.66	19.73	22.58	28.45	35.85	45.16	82.07	103.40
2001	56.40	8.54	10.76	12.32	15.52	19.55	24.63	44.76	56.40
2002	75.20	11.39	14.35	16.42	20.69	26.07	32.85	59.69	75.20
2003	45.40	6.87	8.66	9.92	12.49	15.74	19.83	36.03	45.40
2004	120.80	18.29	23.05	26.38	33.24	41.88	52.76	95.88	120.80
2005	140.00	21.20	26.71	30.58	38.52	48.54	61.15	111.12	140.00
2006	64.00	9.69	12.21	13.98	17.61	22.19	27.95	50.80	64.00
2007	84.00	12.72	16.03	18.35	23.11	29.12	36.69	66.67	84.00
2008	85.20	12.90	16.25	18.61	23.44	29.54	37.21	67.62	85.20
2009	142.00	21.50	27.09	31.01	39.07	49.23	62.02	112.71	142.00
2010	142.00	21.50	27.09	31.01	39.07	49.23	62.02	112.71	142.00
2011	100.80	15.26	19.23	22.01	27.74	34.95	44.03	80.01	100.80
2012	98.40	14.90	18.77	21.49	27.08	34.11	42.98	78.10	98.40
2013	65.40	9.90	12.48	14.28	18.00	22.67	28.57	51.91	65.40
2014	85.10	12.89	16.24	18.59	23.42	29.50	37.17	67.54	85.10
2015	69.10	10.46	13.18	15.09	19.01	23.96	30.18	54.84	69.10
2016	102.60	15.54	19.57	22.41	28.23	35.57	44.81	81.43	102.60

Table 2 Short duration rainfall for Devanahalli

Year	Rainfall (mm)	$P_t = P_{24} \left(\frac{t}{24}\right)^{\frac{1}{3}}$ in mm where, time t is in hours							
Duration in Minutes		**5**	**10**	**15**	**30**	**60**	**120**	**720**	**1440**
1998	146.80	22.23	28.01	32.06	40.39	50.89	64.12	116.52	146.80
1999	78.60	11.90	15.00	17.17	21.63	27.25	34.33	62.38	78.60
2000	70.00	10.60	13.36	15.29	19.26	24.27	30.58	55.56	70.00
2001	92.00	13.93	17.55	20.09	25.31	31.89	40.18	73.02	92.00
2002	46.00	6.97	8.78	10.05	12.66	15.95	20.09	36.51	46.00
2003	54.00	8.18	10.30	11.79	14.86	18.72	23.59	42.86	54.00
2004	46.00	6.97	8.78	10.05	12.66	15.95	20.09	36.51	46.00
2005	118.00	17.87	22.51	25.77	32.47	40.91	51.54	93.66	118.00
2006	57.00	8.63	10.87	12.45	15.68	19.76	24.90	45.24	57.00
2007	132.40	20.05	25.26	28.92	36.43	45.90	57.83	105.09	132.40
2008	73.00	11.05	13.93	15.94	20.09	25.31	31.89	57.94	73.00
2009	64.00	9.69	12.21	13.98	17.61	22.19	27.95	50.80	64.00
2010	56.00	8.48	10.68	12.23	15.41	19.41	24.46	44.45	56.00
2011	88.00	13.33	16.79	19.22	24.21	30.51	38.44	69.85	88.00
2012	71.00	10.75	13.55	15.51	19.54	24.61	31.01	56.35	71.00

2013	89.00	13.48	16.98	19.44	24.49	30.85	38.87	70.64	89.00
2014	73.00	11.05	13.93	15.94	20.09	25.31	31.89	57.94	73.00
2015	76.00	11.51	14.50	16.60	20.91	26.35	33.20	60.32	76.00
2016	84.00	12.72	16.03	18.35	23.11	29.12	36.69	66.67	84.00

Table 3 Short duration rainfall for Doddabalapura

Year	Rainfall (mm)	$P_t = P_{24} \left(\frac{t}{24}\right)^{\frac{1}{3}}$ in mm where, time t is in hours							
Duration in Minutes	**5**	**10**	**15**	**30**	**60**	**120**	**720**	**1440**	
1998	85.00	12.87	16.22	18.56	23.39	29.47	37.13	67.46	85.00
1999	112.00	16.96	21.37	24.46	30.82	38.83	48.92	88.89	112.00
2000	168.00	25.44	32.05	36.69	46.23	58.24	73.38	133.34	168.00
2001	68.60	10.39	13.09	14.98	18.88	23.78	29.96	54.45	68.60
2002	96.80	14.66	18.47	21.14	26.64	33.56	42.28	76.83	96.80
2003	32.00	4.85	6.11	6.99	8.81	11.09	13.98	25.40	32.00
2004	64.00	9.69	12.21	13.98	17.61	22.19	27.95	50.80	64.00
2005	66.00	9.99	12.59	14.41	18.16	22.88	28.83	52.38	66.00
2006	49.00	7.42	9.35	10.70	13.48	16.99	21.40	38.89	49.00
2007	44.00	6.66	8.39	9.61	12.11	15.25	19.22	34.92	44.00
2008	86.00	13.02	16.41	18.78	23.66	29.81	37.56	68.26	86.00
2009	78.40	11.87	14.96	17.12	21.57	27.18	34.24	62.23	78.40
2010	115.00	17.41	21.94	25.12	31.64	39.87	50.23	91.28	115.00
2011	81.00	12.27	15.45	17.69	22.29	28.08	35.38	64.29	81.00
2012	87.20	13.20	16.64	19.04	23.99	30.23	38.09	69.21	87.20
2013	81.00	12.27	15.45	17.69	22.29	28.08	35.38	64.29	81.00
2014	120.00	18.17	22.89	26.21	33.02	41.60	52.41	95.24	120.00
2015	48.00	7.27	9.16	10.48	13.21	16.64	20.97	38.10	48.00
2016	91.00	13.78	17.36	19.87	25.04	31.55	39.75	72.23	91.00

Table 4 Short duration rainfall for Hoskote

Year	Rainfall (mm)	$P_t = P_{24} \left(\frac{t}{24}\right)^{\frac{1}{3}}$ in mm where, time t is in hours							
Duration in Minutes	**5**	**10**	**15**	**30**	**60**	**120**	**720**	**1440**	
1998	135.00	20.44	25.76	29.48	37.15	46.80	58.97	107.15	135.00
1999	180.00	27.26	34.34	39.31	49.53	62.40	78.62	142.87	180.00
2000	91.40	13.84	17.44	19.96	25.15	31.69	39.92	72.54	91.40
2001	65.00	9.84	12.40	14.20	17.89	22.53	28.39	51.59	65.00
2002	84.00	12.72	16.03	18.35	23.11	29.12	36.69	66.67	84.00
2003	79.20	11.99	15.11	17.30	21.79	27.46	34.59	62.86	79.20
2004	160.20	24.26	30.56	34.99	44.08	55.54	69.97	127.15	160.20
2005	68.00	10.30	12.97	14.85	18.71	23.57	29.70	53.97	68.00
2006	69.00	10.45	13.16	15.07	18.99	23.92	30.14	54.77	69.00
2007	87.20	13.20	16.64	19.04	23.99	30.23	38.09	69.21	87.20
2008	86.60	13.11	16.52	18.91	23.83	30.02	37.83	68.73	86.60
2009	91.00	13.78	17.36	19.87	25.04	31.55	39.75	72.23	91.00
2010	100.20	15.17	19.12	21.88	27.57	34.74	43.77	79.53	100.20
2011	43.60	6.60	8.32	9.52	12.00	15.12	19.04	34.61	43.60
2012	97.40	14.75	18.58	21.27	26.80	33.77	42.54	77.31	97.40
2013	60.20	9.12	11.49	13.15	16.56	20.87	26.29	47.78	60.20
2014	63.80	9.66	12.17	13.93	17.56	22.12	27.87	50.64	63.80
2015	52.60	7.97	10.04	11.49	14.47	18.24	22.98	41.75	52.60
2016	84.60	12.81	16.14	18.48	23.28	29.33	36.95	67.15	84.60

B. Normal Distribution

Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	17.29	207.42	17.75	213.02	17.89	214.62	17.96	215.52	17.98	215.81	17.99	215.91	18.00	215.95
10	21.78	130.67	22.37	134.19	22.53	135.21	22.63	135.77	22.66	135.95	22.67	136.01	22.67	136.04
15	24.93	99.72	25.60	102.41	25.80	103.18	25.90	103.61	25.94	103.75	25.95	103.80	25.95	103.82
30	31.41	62.82	32.26	64.51	32.50	65.00	32.64	65.27	32.68	65.36	32.69	65.39	32.70	65.40
60	39.57	39.57	40.64	40.64	40.95	40.95	41.12	41.12	41.17	41.17	41.19	41.19	41.20	41.20
120	49.86	24.93	51.20	25.60	51.59	25.80	51.81	25.90	51.88	25.94	51.90	25.95	51.91	25.95
720	90.60	7.55	93.04	7.75	93.75	7.81	94.14	7.84	94.26	7.86	94.31	7.86	94.33	7.86
1440	114.15	4.76	117.23	4.88	118.11	4.92	118.61	4.94	118.77	4.95	118.82	4.95	118.84	4.95

Table 5 Estimation of maximum rainfall intensity for various return period by Normal Distribution For Anugondanahalli Raingauge Station

Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	14.95	179.41	15.35	184.24	15.47	185.63	15.53	186.40	15.55	186.65	15.56	186.74	15.56	186.78
10	18.84	113.02	19.34	116.06	19.49	116.94	19.57	117.43	19.60	117.58	19.61	117.64	19.61	117.66
15	21.56	86.25	22.14	88.57	22.31	89.24	22.40	89.61	22.43	89.73	22.44	89.77	22.45	89.79
30	27.17	54.34	27.90	55.80	28.11	56.22	28.23	56.45	28.26	56.53	28.28	56.55	28.28	56.57
60	34.23	34.23	35.15	35.15	35.42	35.42	35.56	35.56	35.61	35.61	35.63	35.63	35.63	35.63
120	43.13	21.56	44.29	22.14	44.62	22.31	44.81	22.40	44.87	22.43	44.89	22.44	44.90	22.45
720	78.37	6.53	80.47	6.71	81.08	6.76	81.42	6.78	81.53	6.79	81.56	6.80	81.58	6.80
1440	98.73	4.11	101.39	4.22	102.16	4.26	102.58	4.27	102.72	4.28	102.76	4.28	102.79	4.28

Table 6 Estimation of maximum rainfall intensity for various return period by Normal Distribution For Devanahalli Raingauge station

Table 7 Estimation of maximum rainfall intensity for various return period by Normal Distribution For Doddaballapura Raingauge Station

Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	15.86	190.32	16.32	195.89	16.46	197.50	16.53	198.39	16.56	198.68	16.56	198.77	16.57	198.82
10	19.98	119.89	20.57	123.41	20.74	124.42	20.83	124.98	20.86	125.16	20.87	125.22	20.87	125.25
15	22.87	91.50	23.54	94.18	23.74	94.95	23.84	95.38	23.88	95.52	23.89	95.56	23.90	95.58
30	28.82	57.64	29.66	59.33	29.91	59.81	30.04	60.08	30.09	60.17	30.10	60.20	30.11	60.21
60	36.31	36.31	37.37	37.37	37.68	37.68	37.85	37.85	37.91	37.91	37.92	37.92	37.93	37.93
120	45.75	22.87	47.09	23.54	47.47	23.74	47.69	23.84	47.76	23.88	47.78	23.89	47.79	23.90
720	83.13	6.93	85.56	7.13	86.26	7.19	86.66	7.22	86.78	7.23	86.82	7.24	86.84	7.24
1440	104.74	4.36	107.80	4.49	108.69	4.53	109.18	4.55	109.34	4.56	109.39	4.56	109.42	4.56

Table 8 Estimation of maximum rainfall intensity for various return period by Normal Distribution For Hoskote Raingauge Station

Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	17.21	206.50	17.72	212.65	17.87	214.42	17.95	215.41	17.98	215.73	17.99	215.83	17.99	215.89
10	21.68	130.09	22.33	133.96	22.51	135.08	22.62	135.70	22.65	135.90	22.66	135.97	22.67	136.00
15	24.82	99.28	25.56	102.23	25.77	103.08	25.89	103.56	25.93	103.71	25.94	103.76	25.95	103.79
30	31.27	62.54	32.20	64.40	32.47	64.94	32.62	65.24	32.67	65.33	32.68	65.37	32.69	65.38
60	39.40	39.40	40.57	40.57	40.91	40.91	41.10	41.10	41.16	41.16	41.18	41.18	41.19	41.19
120	49.64	24.82	51.12	25.56	51.54	25.77	51.78	25.89	51.86	25.93	51.88	25.94	51.89	25.95
720	90.20	7.52	92.89	7.74	93.66	7.80	94.09	7.84	94.23	7.85	94.27	7.86	94.30	7.86
1440	113.64	4.74	117.03	4.88	118.00	4.92	118.55	4.94	118.72	4.95	118.78	4.95	118.81	4.95

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C Log Normal Distribution

Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	16.63	199.61	17.18	206.19	17.34	208.13	17.43	209.22	17.46	209.57	17.47	209.68	17.48	209.74
10	20.96	125.74	21.65	129.89	21.85	131.11	21.97	131.80	22.00	132.02	22.02	132.09	22.02	132.13
15	23.99	95.96	24.78	99.13	25.01	100.06	25.15	100.58	25.19	100.75	25.20	100.80	25.21	100.83
30	30.23	60.45	31.22	62.45	31.52	63.03	31.68	63.36	31.73	63.47	31.75	63.50	31.76	63.52
60	38.08	38.08	39.34	39.34	39.71	39.71	39.92	39.92	39.98	39.98	40.00	40.00	40.02	40.02
120	47.98	23.99	49.56	24.78	50.03	25.01	50.29	25.15	50.37	25.19	50.40	25.20	50.42	25.21
720	87.19	7.27	90.06	7.51	90.91	7.58	91.38	7.62	91.54	7.63	91.59	7.63	91.61	7.63
1440	109.85	4.58	113.47	4.73	114.54	4.77	115.14	4.80	115.33	4.81	115.39	4.81	115.42	4.81

Table 9 Estimation of maximum rainfall intensity for various return period by Log Normal Distribution For Anugondanahalli Raingauge Station

Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	14.39	172.68	14.86	178.37	15.00	180.04	15.08	180.97	15.11	181.28	15.11	181.38	15.12	181.43
10	18.13	108.78	18.73	112.36	18.90	113.42	19.00	114.01	19.03	114.20	19.04	114.26	19.05	114.29
15	20.75	83.02	21.44	85.75	21.64	86.55	21.75	87.00	21.79	87.15	21.80	87.20	21.81	87.22
30	26.15	52.30	27.01	54.02	27.26	54.52	27.40	54.81	27.45	54.90	27.47	54.93	27.47	54.95
60	32.94	32.94	34.03	34.03	34.35	34.35	34.53	34.53	34.59	34.59	34.60	34.60	34.61	34.61
120	41.51	20.75	42.87	21.44	43.28	21.64	43.50	21.75	43.57	21.79	43.60	21.80	43.61	21.81
720	75.42	6.29	77.91	6.49	78.64	6.55	79.05	6.59	79.18	6.60	79.22	6.60	79.25	6.60
1440	95.03	3.96	98.16	4.09	99.08	4.13	99.59	4.15	99.76	4.16	99.82	4.16	99.84	4.16

Table 10 Estimation of maximum rainfall intensity for various return period by Log Normal Distribution For Devanahalli Raingauge station

D Gumbel's Distribution

Table 11 Estimation of maximum rainfall intensity for various return period by Log Normal Distribution For Doddabalapura Raingauge Station															
Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	15.12	181.46	15.67	188.08	15.84	190.02	15.93	191.12	15.96	191.47	15.97	191.59	15.97	191.64
10	19.05	114.31	19.75	118.48	19.95	119.71	20.07	120.40	20.10	120.62	20.12	120.69	20.12	120.73
15	21.81	87.24	22.60	90.42	22.84	91.35	22.97	91.88	23.01	92.05	23.03	92.11	23.03	92.13
30	27.48	54.96	28.48	56.96	28.77	57.55	28.94	57.88	28.99	57.99	29.01	58.02	29.02	58.04
60	34.62	34.62	35.88	35.88	36.25	36.25	36.46	36.46	36.53	36.53	36.55	36.55	36.56	36.56
120	43.62	21.81	45.21	22.60	45.68	22.84	45.94	22.97	46.02	23.01	46.05	23.03	46.07	23.03
720	79.26	6.61	82.15	6.85	83.00	6.92	83.48	6.96	83.63	6.97	83.68	6.97	83.71	6.98
1440	99.86	4.16	103.50	4.31	104.57	4.36	105.18	4.38	105.37	4.39	105.43	4.39	105.47	4.39

Table 12 Estimation of maximum rainfall intensity for various return period by Log Normal Distribution For Hoskote Raingauge Station															
Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	16.37	196.47	16.98	203.77	17.16	205.93	17.26	207.14	17.29	207.53	17.30	207.66	17.31	207.72
10	20.63	123.77	21.40	128.37	21.62	129.73	21.75	130.49	21.79	130.74	21.80	130.82	21.81	130.86
15	23.61	94.45	24.49	97.96	24.75	99.00	24.90	99.58	24.94	99.77	24.96	99.83	24.97	99.86
30	29.75	59.50	30.86	61.71	31.18	62.37	31.37	62.73	31.43	62.85	31.44	62.89	31.45	62.91
60	37.48	37.48	38.88	38.88	39.29	39.29	39.52	39.52	39.59	39.59	39.62	39.62	39.63	39.63
120	47.23	23.61	48.98	24.49	49.50	24.75	49.79	24.90	49.88	24.94	49.92	24.96	49.93	24.97
720	85.81	7.15	89.01	7.42	89.95	7.50	90.48	7.54	90.65	7.55	90.70	7.56	90.73	7.56
1440	108.12	4.50	112.14	4.67	113.33	4.72	113.99	4.75	114.21	4.76	114.28	4.76	114.31	4.76

Table 13 Estimation of maximum rainfall intensity for various return period by Gumble's Distribution For Anngondanahalli Raingauge Station													
Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	13.16	157.92	17.44	209.29	20.24	242.93	23.81	285.72	26.46	317.46	27.99	335.91	29.08	348.97
10	16.58	99.48	21.97	131.84	25.51	153.04	30.00	179.99	33.33	199.99	35.27	211.61	36.64	219.84
15	18.98	75.92	25.15	100.62	29.20	116.79	34.34	137.36	38.15	152.62	40.37	161.49	41.94	167.77
30	23.91	47.83	31.69	63.38	36.79	73.57	43.27	86.53	48.07	96.14	50.87	101.73	52.84	105.69
60	30.13	30.13	39.93	39.93	46.35	46.35	54.51	54.51	60.57	60.57	64.09	64.09	66.58	66.58
120	37.96	18.98	50.31	25.15	58.39	29.20	68.68	34.34	76.31	38.15	80.74	40.37	83.88	41.94
720	68.98	5.75	91.42	7.62	106.11	8.84	124.80	10.40	138.66	11.56	146.72	12.23	152.43	12.70
1440	86.90	3.62	115.18	4.80	133.69	5.57	157.24	6.55	174.71	7.28	184.86	7.70	192.05	8.00

Table 14 Estimation of maximum rainfall intensity for various return period by Gumble's Distribution For Devanahalli Raingauge Station													
Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	11.39	136.66	15.09	181.02	17.51	210.07	20.58	247.02	22.87	274.42	24.20	290.36	25.14	301.63
10	14.35	86.09	19.01	114.04	22.06	132.34	25.94	155.61	28.81	172.88	30.49	182.91	31.67	190.02
15	16.43	65.70	21.76	87.03	25.25	100.99	29.69	118.75	32.98	131.93	34.90	139.59	36.25	145.01
30	20.69	41.39	27.41	54.82	31.81	63.62	37.40	74.81	41.56	83.11	43.97	87.94	45.68	91.35
60	26.07	26.07	34.54	34.54	40.08	40.08	47.13	47.13	52.36	52.36	55.40	55.40	57.55	57.55
120	32.85	16.43	43.51	21.76	50.50	25.25	59.38	29.69	65.96	32.98	69.79	34.90	72.50	36.25
720	59.69	4.97	79.07	6.59	91.76	7.65	107.89	8.99	119.87	9.99	126.82	10.57	131.75	10.98
1440	75.21	3.13	99.62	4.15	115.61	4.82	135.94	5.66	151.02	6.29	159.79	6.66	165.99	6.92

Table 15 Estimation of maximum rainfall intensity for various return period by Gumble's Distribution For Doddabalapura Raingauge Station													
Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	11.75	140.96	16.01	192.18	18.81	225.72	22.36	268.37	25.00	300.02	26.53	318.42	27.62	331.43
10	14.80	88.80	20.18	121.06	23.70	142.19	28.18	169.07	31.50	189.00	33.43	200.59	34.80	208.79
15	16.94	67.77	23.10	92.39	27.13	108.51	32.26	129.02	36.06	144.24	38.27	153.08	39.83	159.34
30	21.35	42.69	29.10	58.20	34.18	68.36	40.64	81.28	45.43	90.86	48.22	96.43	50.19	100.38
60	26.89	26.89	36.66	36.66	43.06	43.06	51.20	51.20	57.24	57.24	60.75	60.75	63.23	63.23
120	33.88	16.94	46.19	23.10	54.26	27.13	64.51	32.26	72.12	36.06	76.54	38.27	79.67	39.83
720	61.57	5.13	83.94	7.00	98.59	8.22	117.22	9.77	131.05	10.92	139.08	11.59	144.77	12.06
1440	77.57	3.23	105.76	4.41	124.22	5.18	147.69	6.15	165.11	6.88	175.23	7.30	182.40	7.60

Table 16 Estimation of maximum rainfall intensity for various return period by Gumble's Distribution For Hoskote Raingauge Station													
Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	12.67	152.03	17.38	208.55	20.46	245.57	24.39	292.65	27.30	327.57	28.99	347.87	30.19	362.24
10	15.96	95.77	21.90	131.38	25.78	154.70	30.73	184.36	34.39	206.36	36.52	219.15	38.03	228.20
15	18.27	73.09	25.07	100.26	29.51	118.06	35.17	140.69	39.37	157.48	41.81	167.24	43.54	174.15
30	23.02	46.04	31.58	63.16	37.19	74.37	44.31	88.63	49.60	99.21	52.68	105.36	54.85	109.71
60	29.00	29.00	39.79	39.79	46.85	46.85	55.83	55.83	62.50	62.50	66.37	66.37	69.11	69.11
120	36.54	18.27	50.13	25.07	59.03	29.51	70.35	35.17	78.74	39.37	83.62	41.81	87.07	43.54
720	66.40	5.53	91.09	7.59	107.26	8.94	127.83	10.65	143.08	11.92	151.95	12.66	158.22	13.19
1440	83.66	3.49	114.77	4.78	135.14	5.63	161.05	6.71	180.27	7.51	191.44	7.98	199.35	8.31

E. Pearson Type III Distribution

Duration in minutes	Table 17 Estimation of maximum rainfall intensity for various return period by Pearson type III Distribution For Anugondanahalli Raingauge Station													
	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	13.95	167.42	18.01	216.13	20.13	241.59	22.39	268.72	23.85	286.25	25.17	301.98	26.37	316.44
10	17.58	105.47	22.69	136.16	25.36	152.19	28.21	169.28	30.05	180.32	31.71	190.24	33.22	199.35
15	20.12	80.49	25.98	103.91	29.04	116.14	32.30	129.19	34.40	137.61	36.29	145.18	38.03	152.13
30	25.35	50.70	32.73	65.46	36.58	73.17	40.69	81.38	43.35	86.69	45.73	91.46	47.92	95.84
60	31.94	31.94	41.24	41.24	46.09	46.09	51.27	51.27	54.61	54.61	57.61	57.61	60.37	60.37
120	40.24	20.12	51.95	25.98	58.07	29.04	64.59	32.30	68.81	34.40	72.59	36.29	76.06	38.03
720	73.13	6.09	94.40	7.87	105.52	8.79	117.37	9.78	125.03	10.42	131.90	10.99	138.22	11.52
1440	92.14	3.84	118.94	4.96	132.95	5.54	147.88	6.16	157.53	6.56	166.19	6.92	174.15	7.26

Duration in minutes	Table 18 Estimation of maximum rainfall intensity for various return period by Pearson type III Distribution For Devanahalli Raingauge Station													
	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	12.07	144.87	15.58	186.93	17.41	208.91	19.36	232.34	20.62	247.47	21.75	261.06	22.80	273.54
10	15.21	91.26	19.63	117.76	21.93	131.60	24.39	146.36	25.98	155.90	27.41	164.46	28.72	172.32
15	17.41	69.65	22.47	89.87	25.11	100.43	27.92	111.70	29.74	118.97	31.38	125.50	32.88	131.51
30	21.94	43.88	28.31	56.61	31.63	63.27	35.18	70.36	37.47	74.95	39.53	79.06	41.42	82.84
60	27.64	27.64	35.66	35.66	39.86	39.86	44.33	44.33	47.21	47.21	49.81	49.81	52.19	52.19
120	34.82	17.41	44.93	22.47	50.22	25.11	55.85	27.92	59.49	29.74	62.75	31.38	65.75	32.88
720	63.28	5.27	81.65	6.80	91.25	7.60	101.48	8.46	108.09	9.01	114.03	9.50	119.48	9.96
1440	79.73	3.32	102.87	4.29	114.97	4.79	127.86	5.33	136.19	5.67	143.67	5.99	150.54	6.27

Table 19 Estimation of maximum rainfall intensity for various return period by Pearson type III Distribution For Doddabalapura Raingauge Station

Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	12.54	150.44	16.58	199.00	18.70	224.38	20.95	251.43	22.41	268.90	23.72	284.59	24.92	299.01
10	15.80	94.77	20.89	125.36	23.56	141.35	26.40	158.39	28.23	169.40	29.88	179.28	31.39	188.36
15	18.08	72.32	23.92	95.67	26.97	107.87	30.22	120.87	32.32	129.27	34.20	136.82	35.94	143.75
30	22.78	45.56	30.13	60.27	33.98	67.95	38.07	76.15	40.72	81.44	43.09	86.19	45.28	90.56
60	28.70	28.70	37.97	37.97	42.81	42.81	47.97	47.97	51.30	51.30	54.30	54.30	57.05	57.05
120	36.16	18.08	47.83	23.92	53.93	26.97	60.44	30.22	64.64	32.32	68.41	34.20	71.87	35.94
720	65.71	5.48	86.92	7.24	98.01	8.17	109.82	9.15	117.45	9.79	124.31	10.36	130.60	10.88
1440	82.79	3.45	109.51	4.56	123.48	5.14	138.36	5.77	147.98	6.17	156.61	6.53	164.55	6.86

Table 20 Estimation of maximum rainfall intensity for various return period by Pearson type III Distribution For Hoskote Raingauge Station

Duration in minutes	Return period 2 yrs		Return period 5 yrs		Return period 10 yrs		Return period 25 yrs		Return period 50 yrs		Return period 75 yrs		Return period 100 yrs	
	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)	Rainfall Depth(mm)	Rainfall Intensity (mm/hr)
5	13.54	162.49	18.01	216.08	20.34	244.09	22.83	273.94	24.44	293.23	25.88	310.54	27.20	326.45
10	17.06	102.36	22.69	136.12	25.63	153.77	28.76	172.57	30.79	184.72	32.60	195.63	34.28	205.65
15	19.53	78.12	25.97	103.88	29.34	117.35	32.92	131.70	35.24	140.97	37.32	149.29	39.24	156.94
30	24.61	49.21	32.72	65.44	36.96	73.92	41.48	82.96	44.40	88.81	47.02	94.05	49.43	98.87
60	31.00	31.00	41.23	41.23	46.57	46.57	52.26	52.26	55.94	55.94	59.25	59.25	62.28	62.28
120	39.06	19.53	51.94	25.97	58.67	29.34	65.85	32.92	70.48	35.24	74.65	37.32	78.47	39.24
720	70.97	5.91	94.38	7.87	106.62	8.88	119.65	9.97	128.08	10.67	135.64	11.30	142.59	11.88
1440	89.42	3.73	118.91	4.95	134.33	5.60	150.76	6.28	161.37	6.72	170.90	7.12	179.65	7.49

F Chi-Square Test

To identify a specific theoretical distribution for the available data it is important to do a test. The aim of the test is to find how good a fit is between the observed and the predicted data. Chi-square is one of the most widely used tests to find the best fit theoretical distribution of any specific dataset which is represented by Equation B.

$$\chi2 = \sum_{i=1}^{n}(O_i - E_i)^2 / E_i$$

(B) where, O_i and E_i represent the observed and expected frequencies respectively. If the observed frequencies are close to the corresponding expected frequencies, the $\chi2$ value will be small, indicating a good fit; otherwise it will be a poor fit. (Rashid et al, 2012)

Table 21 : Chi –Square Test For Anugondanahalli Raingauge Station									
Duration in minutes	Observed values	NORMAL DISTRIBUTION		LOG-NORMAL DISTRIBUTION		GUMBELS DISTRIBUTION		PEARSON TYPE III	
		Expected values	Chi-square values	Expected values	Chi-square values	Expected values	Chi-square values	Expected values	Chi-square values
5	13.95	17.84	0.85	17.29	0.64	22.60	3.31	21.41	2.60
10	17.58	22.47	1.07	21.78	0.81	28.47	4.17	26.98	3.27
15	20.12	25.72	1.22	24.93	0.93	32.59	4.77	30.88	3.75
30	25.35	32.41	1.54	31.41	1.17	41.06	6.01	38.91	4.72
60	31.94	40.84	1.94	39.58	1.47	51.74	7.57	49.02	5.95
120	40.24	51.45	2.44	49.87	1.86	65.18	9.54	61.76	7.50
720	73.13	93.49	4.43	90.61	3.37	118.44	17.34	112.23	13.62
1440	92.14	117.79	5.59	114.16	4.25	149.23	21.84	141.40	17.16

Table 22 : Chi –Square Test For Devanahalli Raingauge Station									
Duration in minutes	Observed values	NORMAL DISTRIBUTION		LOG-NORMAL DISTRIBUTION		GUMBELS DISTRIBUTION		PEARSON TYPE III	
		Expected values	Chi-square values	Expected values	Chi-square values	Expected values	Chi-square values	Expected values	Chi-square values
5	12.07	15.43	0.73	14.95	0.56	19.54	2.85	18.51	2.24
10	15.21	19.44	0.92	18.84	0.70	24.62	3.59	23.33	2.82
15	17.41	22.25	1.05	21.57	0.80	28.18	4.11	26.70	3.23
30	21.94	28.03	1.33	27.17	1.01	35.50	5.18	33.64	4.07
60	27.64	35.32	1.67	34.24	1.27	44.73	6.53	42.39	5.13
120	34.82	44.50	2.10	43.13	1.60	56.36	8.23	53.40	6.46
720	63.28	80.86	3.82	78.38	2.91	102.41	14.95	97.04	11.74
1440	79.73	101.88	4.82	98.75	3.67	129.03	18.84	122.26	14.80

Table 23 : Chi –Square Test For Doddabalapura Raingauge Station									
Duration in minutes	Observed values	NORMAL DISTRIBUTION		LOG-NORMAL DISTRIBUTION		GUMBELS DISTRIBUTION		PEARSON TYPE III	
		Expected values	Chi-square values	Expected values	Chi-square values	Expected values	Chi-square values	Expected values	Chi-square values
5	12.54	16.41	0.91	15.78	0.67	21.16	3.51	19.97	2.77
10	15.80	20.67	1.15	19.88	0.84	26.65	4.42	25.16	3.49
15	18.08	23.67	1.32	22.76	0.96	30.51	5.06	28.81	3.99
30	22.78	29.82	1.66	28.67	1.21	38.44	6.38	36.29	5.03
60	28.70	37.57	2.09	36.12	1.52	48.44	8.04	45.73	6.34
120	36.16	47.33	2.64	45.51	1.92	61.02	10.13	57.61	7.99

| 720 | 65.71 | 86.01 | 4.79 | 82.70 | 3.49 | 110.89 | 18.41 | 104.69 | 14.51 |
| 1440 | 82.79 | 108.36 | 6.04 | 104.20 | 4.40 | 139.71 | 23.19 | 131.90 | 18.28 |

Table 24 : Chi –Square Test For Hoskote Raingauge Station									
Duration in minutes	Observed values	NORMAL DISTRIBUTION		LOG-NORMAL DISTRIBUTION		GUMBELS DISTRIBUTION		PEARSON TYPE III	
		Expected values	Chi-square values	Expected values	Chi-square values	Expected values	Chi-square values	Expected values	Chi-square values
5	13.54	17.81	1.03	17.10	0.74	23.05	3.93	21.75	3.10
10	17.06	22.45	1.29	21.54	0.93	29.05	4.95	27.40	3.90
15	19.53	25.69	1.48	24.66	1.07	33.25	5.66	31.37	4.47
30	24.61	32.37	1.86	31.07	1.34	41.89	7.13	39.52	5.63
60	31.00	40.79	2.35	39.14	1.69	52.78	8.99	49.79	7.09
120	39.06	51.39	2.96	49.32	2.13	66.50	11.32	62.73	8.93
720	70.97	93.38	5.37	89.62	3.88	120.83	20.57	113.99	16.23
1440	89.42	117.65	6.77	112.91	4.89	152.24	25.92	143.62	20.45
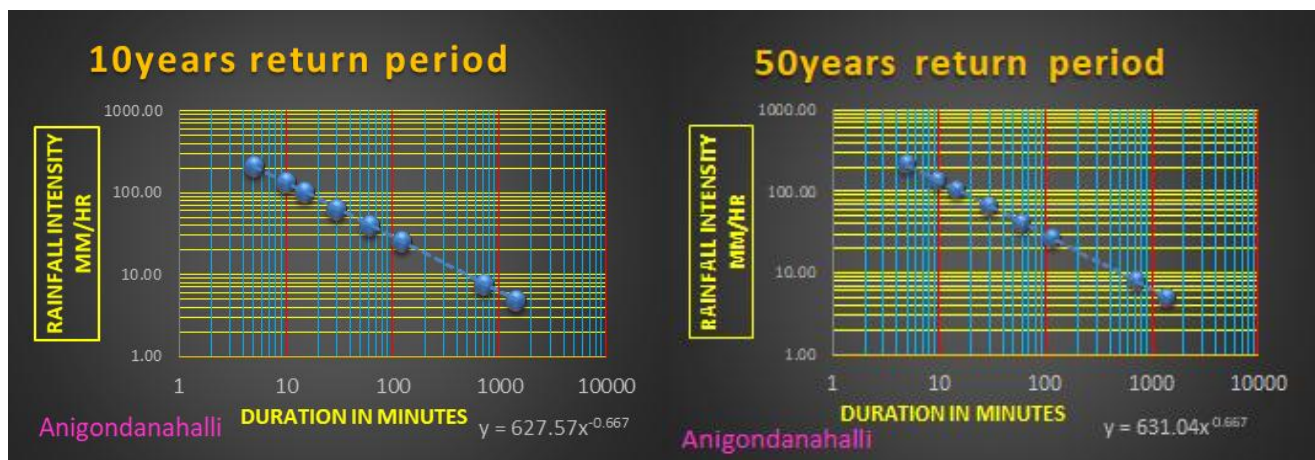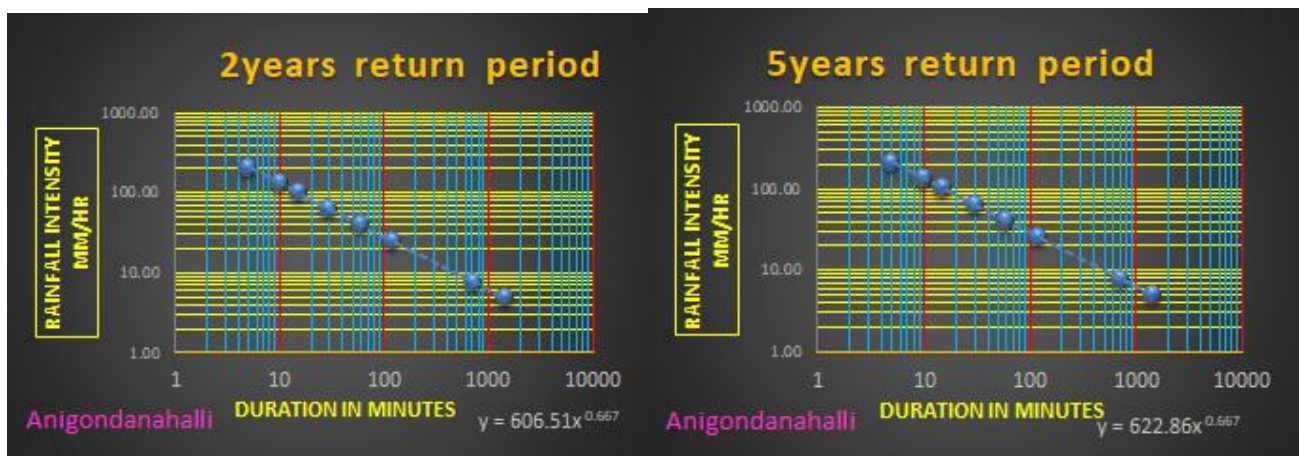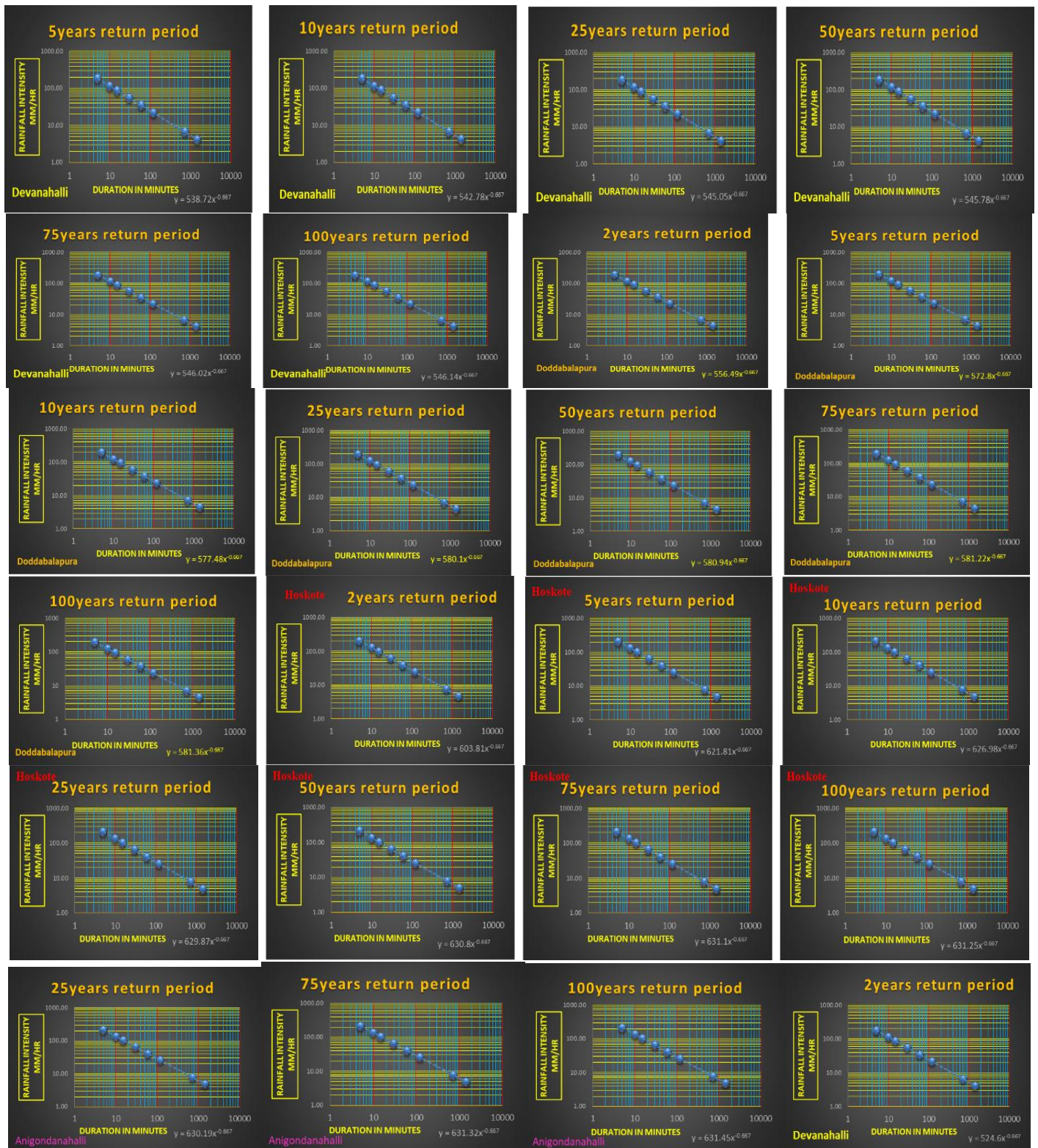
Figure 3   IDF Curves for Different Return Period Using Normal Distribution
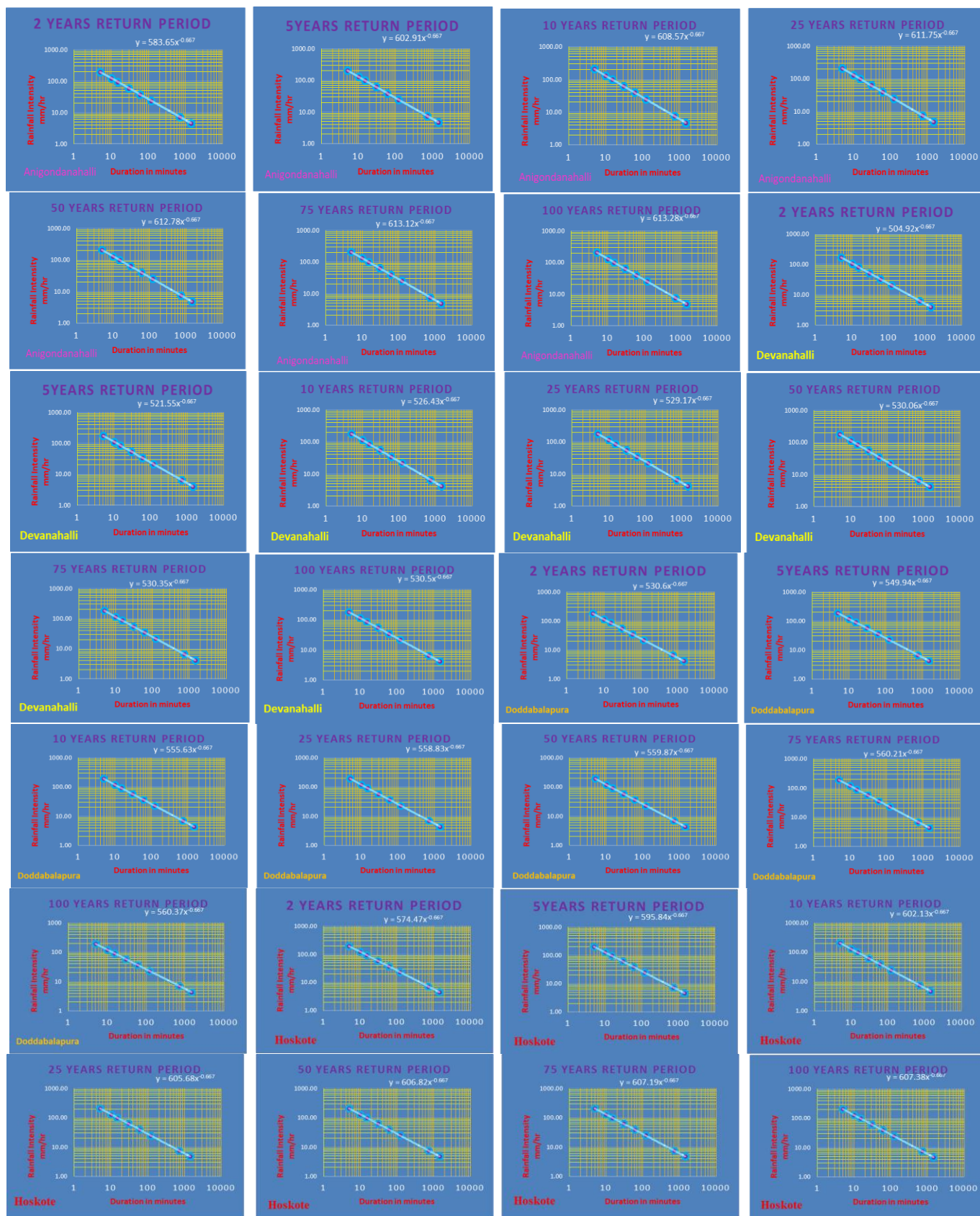
Figure 4   IDF Curves for Different Return Period Using Log Normal Distribution
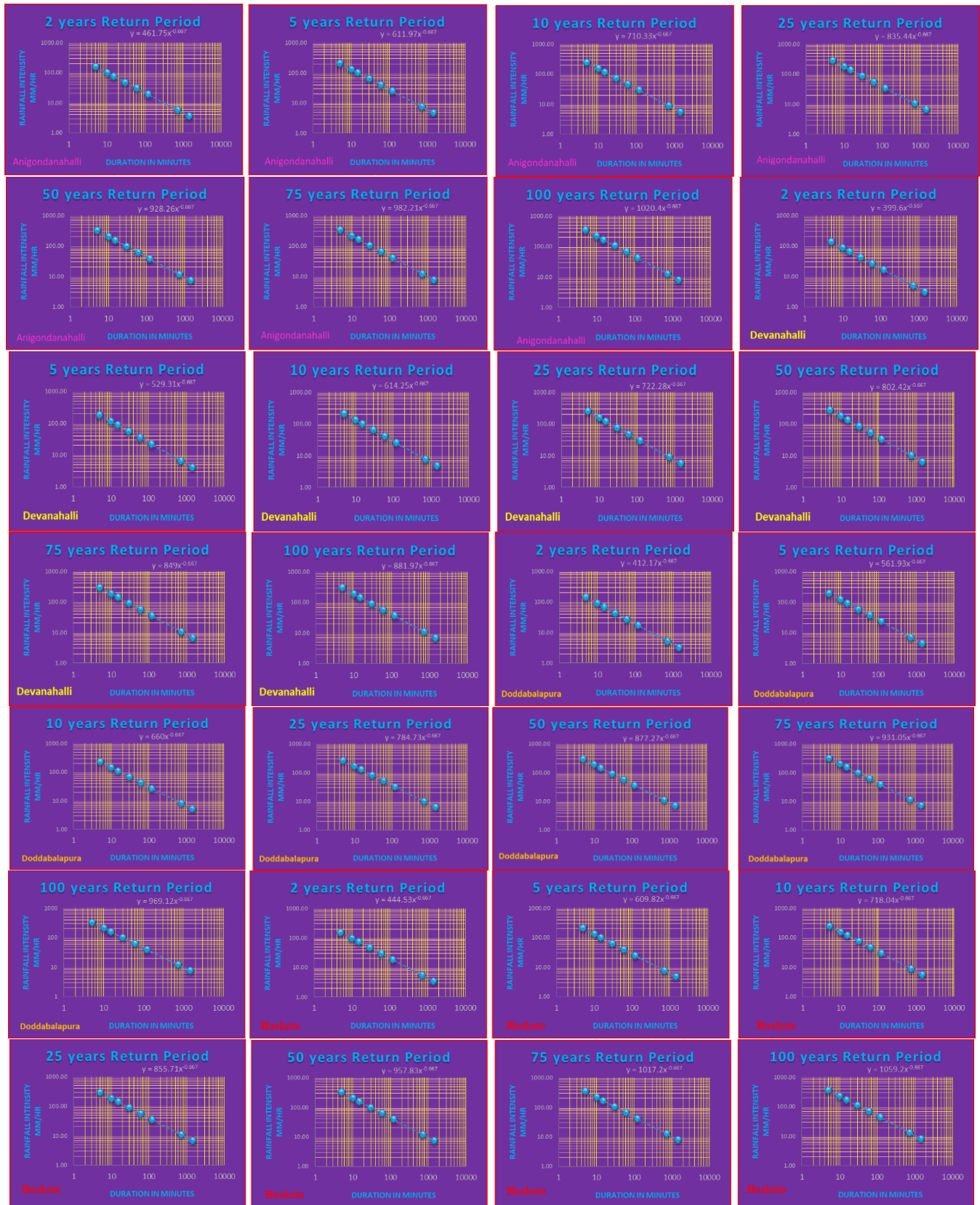
Figure 5   IDF Curves for Different Return Period Using Gumbel's Distribution
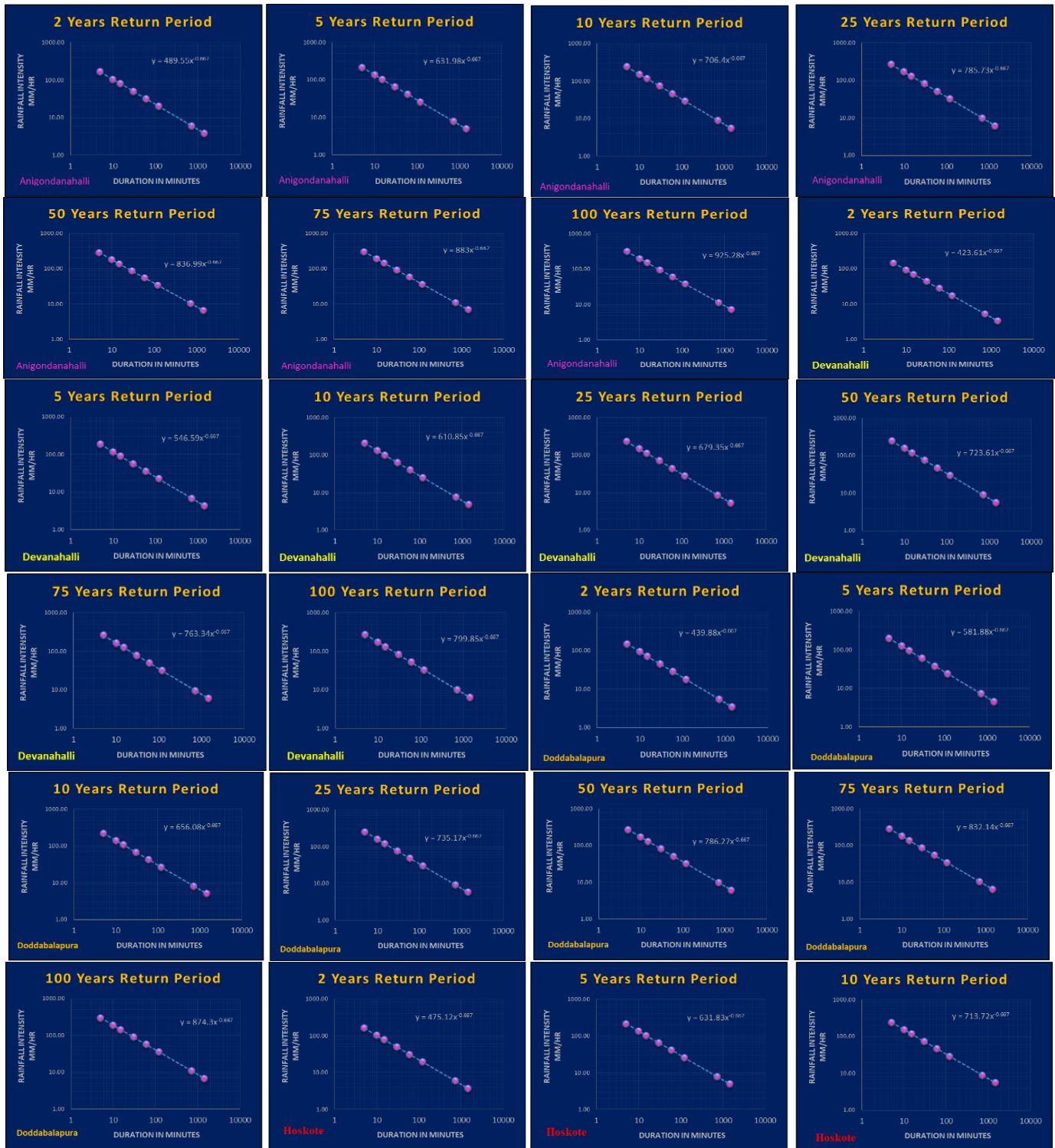
Figure 6   IDF Curves for Different Return Period Using Pearson Type III Distribution

IV. CONCLUSIONS

The present work shows a methodology for the evaluation of the IDF curves from daily rainfall data. In particular, to obtain durations shorter than 24 hours, Four different models of disaggregation were applied to the historical data available for Four raingauge stations of Bangalore rural : Anugondanahalli, Devanahally, Doddabalapura and Hoskote. Among the various available probability distribution functions Log_ Normal distribution had the best approximation of rainfall intensity for various return periods. These IDF equations will help to estimate the rainfall intensity for any specific return period in a short time and more easily. The results computed can be utilized for developing surface drain network for recharging ground water.

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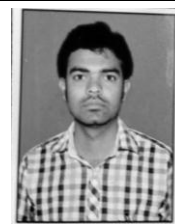
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