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FLOOD FREQUENCY ANALYSIS FOR RIVER GAUGING STATION OF MEENACHIL RIVER, KOTTAYAM, INDIA

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Abstract - *The extreme flood events are always a chapter of concern all told river basins, among loss of property, lives and economics. Estimation of flood peak discharge for a desired return period is pre-requisite for geographical region management, design and execution of structures like bridges, culverts, dams, etc. Hence flood frequency analysis is important to predict the flood peaks of various return periods. Estimation of flood magnitude is predicated on probability of flood events. Most important method utilized to estimate intensity of flood magnitude is Flood Frequency Analysis. Four statistical techniques namely Generalized Extreme Value (GEV), Log Pearson III (LPIII), Gumbel Max, and Gaussian distribution are evaluated in present study for measuring severity of flood. To estimate return period of flood, four gauging stations of River Meenachil river that's Kidangoor are deemed for this work. The flood peak value is completed for 2-, 10-, 50-, and 100-year where computed and further extra polagion may be done to search out out the flood discharge of any return period. The analysis used 34 years of knowledge (1985-2018) to model annual maximum discharge. Peak discharges are found out from daily discharge data at kidangoor gauging station with different return period starting from 2-, 10-, 50- and 100-year and a comparison has been made for locating best fit model. Goodness-of-fit test are used at 5% significance level. Outcomes signify that Gumbel Max is best fitted distribution ranked as 1st, whereas LP III, GEV and Gaussian distribution are observed to be least fitted in 2nd, 3rd and 4th order, respectively. The plots of return period versus stream flow and reduced variate versus flood peak showed that the Gumbel's extreme value distribution is suitable for predicting the expected flood flow in Meenachil River. Here, sensitivity analysis is taken into account representing a sign of flood warning. Significance of current study lies in its potential for predicting discharge supported return period after finding an appropriate distribution for sites under study.*

***Keywords*: Generalized Extreme Value, Log Pearson III, Gumbel Max, Normal distribution, Goodness-of-fit, Return period.**

1. INTRODUCTION

1.1 General Background

Flood is one altogether the devastating natural disasters which occur in India once a year during the south west monsoon season. In planning and magnificence of water resources projects, it's important to figure out the magnitude and frequency of flood which is ready to occur within the project area. Flood frequency analysis is that the strategy of fitting a probability model to annual flood peak data recorded over a period of observation at a catchment outlet. The model parameters thus established can then be wont to predict the flood peaks of desired return period. Meenachil River show the threat of wide spread illegal sand mining. Previously the banks of the river were substantially enriched with sands. Now the banks of the river are full of grasses and dirt. The depth of river is increasing day by day because of this illegal sand mining. The sewage pollution is additionally another menace of the river. This river isn't exceptional to annual floods during monsoon and causing destruction to the ultimate public. Meenachil River is incredibly dangerous and wild during flood season thanks to the depth of river. Intense flood and event after peak flood provides important statistics for hydrologic design. To estimate the magnitude of flood several methods like rational method, empirical method, unit hydrograph, and flood occurrence study are adoptted.. For reducing damages caused by flood and protect human lives, generally flood modeling is dispensed for estimating flood linked with concerned return periods, which is believed as design flood. Estimation of design flood is significant for various purposes which contains management of flood plains, planning and development controls, flood insurance studies and elegance of hydraulic structures. Among several methods accessible for estimating design flood, the foremost direct method is that the at-site FFA. additionally, it is a benchmark for assessing accurateness of other methods applicable for estimating flood the same as the rainfall runoff modeling and regional flood estimation technique. The aim of FFA is to estimate return period associated with a specified magnitude of flood. Reasonably, at-site FFA needs an extended period of collected river flow data. As accessible recorded data length is way smaller at several gauged rivers than specified return period, design flood estimation often necessitates certain degree of extrapolation. In FFA, selecting a probability distribution is of major significance as an incorrect selection may lead to substantial bias.

1.2 Flood Frequency Analysis

Flood frequency analysis may well be a way employed by hydrologists to predict flow values resembling specific return periods or probabilities along a river. the appliance of

statistical frequency curves to floods was first introduced by Gumbel. Using annual peak flow data that's available for form of years, flood frequency analysis is used to calculate statistical information like mean, variance and skewness which is further accustomed create distribution graphs. Flood frequency plays a crucial role in providing estimates of recurrence of floods which is utilized in designing structures like dams, bridges, culverts, levees, highways, disposition plants, waterworks and industrial buildings. so on guage the optimum design specification for hydraulic structures, and to forestall over-designing or under designing, it's imperative to use statistical tools to create flood frequency estimates. These estimates are useful in providing a measurement parameter to analyse the damage like specific flows during floods. along with hydraulic design, flood frequency estimates are also useful overflowing insurance and flood zoning activities. Accurate estimation of flood frequency not only helps engineers in designing safe structures but also in protection against losses in economic due to maintenance of structures. swollen frequency analysis the target is to estimate a flood magnitude kind of like any required return period of occurrence. The resulting magnitude-return period relationship are cited because the Q - T relationship. the target of flood frequency analysis (FFA) is to associate flood intensity with a probability of exceedance. Many methods are currently employed for this, ranging from distribution fitting to simulation approaches. Many hydrological engineering planning, design, and management problems require a detailed knowledge of flood event characteristics, like flood peak, volume and duration. Flood frequency analysis often point on flood peak values, and hence, provides a limited assessment of flood events. The importance of flood frequency lies in its ability to predict the discharge for a return period after a suitable distribution is found for an area. Extremely great floods are among environmental events with the foremost disastrous consequences for the entire world. Estimates of their return periods and elegance values are of great importance in hydrologic modelling, engineering practice for water resources and reservoirs design and management, planning for weather-related emergencies, etc. Regional flood frequency analysis resolves the matter of estimating the extreme flood events for catchments having short data records or ungauged catchments. Flood frequency analysis is further shown to possess attractive features for estimating extremes for unusual sites during a very network of gauging stations.

2. LITERATURE REVIEW

Abinash Sahoo, Dileep K. Ghose [1] This work is administrated in four sensitive gauging stations of Mahanadi geographic region considering hydrological data. GEV, LP-III, Gumbel Max and Gaussian distribution methods are employed for predicting flood frequency and a relationship is established to seek out out peak discharge during monsoon period. Flood plain of Mahanadi geographical region is interfered between two states Chhattisgarh and Odisha, and 4 gauging stations are politically sensitive to encourage the encroachment of illegal construction of hydraulic structures. within the present study, the straightforward fit software is employed for locating goodness of fit and also the effectiveness of proposed probability distribution methods. it's observed that consideration of the statistical distribution with lower range of probability trigger warnings earlier to sensitive gauging stations. The statistical approaches are acceptable tune the magnitude of flood with frequency distribution The research results also can be used for 2D and 3D flood modeling. The extent of simulated flood may be recommended for control and hazard assessment of Mahanadi geographic area.

Khan Mujiburrehman Environmental Engineer, Dar Al Handasa, Makkah [2] This presents a frequency distribution study on maximum monthly flood data on Narmada River is conducted. The Normal, Lognormal, Log pearson type III and Gumbell extreme value type I are proposed and tested together with their single distributions to identify the optimal model for maximum monthly flood analysis. Normal distribution curve has been identified as the best fitting distribution for flood data in Narmada River at Garudeshwar station. The estimation for the best fitting distribution for Maximum monthly flood data amount has been the main interest in several studies. Various forms of distributions have been tested in order to find the best fitting distribution. Different types of goodness of-fit tests have been attempted in this study. the Normal distribution curve has been identified as the best fitting distribution for flood data in Narmada River at Garudeshwar station. However, the flood data should be further analyzed and corrected for missing data, historical data and Zero flood values.

M. Ramasamy a, S. Nagan a, P. Senthil Kumar b,c, [3] In this study, peak flood flow data for the periods of twenty-four years of daily flow measured in stepped weir. It is having advantages of measuring accurate discharge during the different elevations of flow according to the seasonal changes and monsoon conditions in the river basin and catchment area. The gauging station is located near the Vaigai reservoir at Andipatti in Theni district, Tamil Nadu, India, the reservoir water is useful for hydropower generation, irrigation, small scale industries and drinking for four districts in Tamil Nadu. Two methods are used in predicting the future expected flood discharge in the gauging station for different return periods of 5,10,50,75,100, and 1000. Among six different T values, the first two short frequencies of events 5 and 10 two methods show comparatively the same results. As such, the extended RP values of 50, 75, 100, and 1000, the predicted magnitudes show high variation. In the case of LLRGM indicates the constant rate of increase of flood magnitudes for different length of RP and merely a straight line extended for the longer duration since such direct proportionality does not

exist and its accuracy mainly depends on R2 values. In this case, it is 0.8904. If this value is 1 and it is assumed to be the highly correct magnitude. It is measured that the maximum daily peak flow measured 8.7595 × 102 (cumecs) in the year 1998, and the predicted RP of 5,10,50, and 75 magnitudes are already existing in the record, and even the RP of 100 magnitudes is very closer this value of 8.970 × 102 (cumecs).

Sandeep Samantaray and Abinash Sahoo [4] during this paper, an endeavor has been made to forecast discharges at various return periods using statistical methods. Here, four statistical methods are accustomed predict flow discharge within the Mahanadi geographical area, covering four stations. Four organization methods, namely, Normal, LP III, Gumbel max, and Gen. extreme value method are employed here. supported the trends of the last 60 years, the utmost and minimum discharges are found at 150 years and 10 years' return period, respectively. the speed of increase of discharge is extremely high at the initial return periods and so it becomes constant and eventually lower. The shapes of the graphs are common in nature and most of the time they are doing not intersect with one another. In most of the cases, Gumbel max gives the height flood Figure 4 | Confidence band for monsoon season of gauging stations (a) Rampur, (b) Sundargarh, (c) Jondhra, and (d) Basantpur. The Gumbel max is that the most generally used method to get flood discharge as this may be used for infinite sample sizes. The influencing factor of frequency is analyzed on the premise of research of the runoff complexity from drainage basins.

Nirman Bhagat [5] during this paper flood frequency analysis disbursed for Lower Mahi River using 30 year's annual peak flow data. Graph shows a plot of the reduced variate and peak flood of the river using the observed data. From the line equation, R 2 gives a worth of 0.9649. the worth r = 0.9649 shows that the pattern of the scatter is narrow which Gumbel's distribution method is suitable for predicting expected flow within the river. Also the instantaneous mean flow within the river is 10242 m3 /s which has a return period of about 2 years and it's visible within the flood peak data also. this implies the prediction of floods within the basin is sort of accurate. This prediction of flood will be utilized within the designing of important hydraulic structures and bridges within the river reach. Also just in case of utmost floods emergency evacuation of individuals will be distributed well before. Similar study can even be disbursed on another study region, because the method used for the study has a continuing formula, which remains spatially constant.

Bahram Saghafian, Saeed Golian, Alireza Ghasemi [6] Flood frequency approaches vary from statistical methods, directly applied on the observed annual maximum flood series, to adopting rainfall–runoff simulation models that transform design rainfalls to flood discharges. Reliance on statistical flood frequency analysis depends on several factors like the chosen probability distribution function, estimation of the function parameters, possible outliers, and length of the observed flood series. Through adopting the simulation approach during this paper, watershed-average rainfalls of assorted occurrence probabilities were transformed into the corresponding peak discharges employing a calibrated hydrological model. A Monte Carlo scheme was employed to contemplate the uncertainties involved in rainfall spatial patterns and antecedent soil moisture condition (AMC). For any given rainfall depth, realizations of rainfall spatial distribution and AMC conditions were entered as inputs to the model. Then, floods of various return periods were simulated by transforming rainfall to runoff.

Biskra (Algeria)S. Benameur, A. Benkhaled, D. Meraghni, F. Chebana and A. Necir [7] the most objective of this study is to estimate flood events of Abiod wadi at given return periods at the gauge station of M'chouneche, located closely to town of Biskra during a semiarid region of southern east of Algeria. this can be a problematic issue in several ways, thanks to the existence of a dam to the downstream, including the sector of the sedimentation and also the water leaks through the dam during floods. The considered data series is new. an entire frequency analysis is performed on a series of observed daily average discharges, including classical statistical tools yet as recent techniques. The obtained results show that the generalized Pareto distribution (GPD), that the parameters were estimated by the utmost likelihood (ML) method, describes the analyzed series better. Also, to the decision-makers the importance to regular monitoring data at this station.

Muhammad Farooq & Muhammad Shafique1 & Muhammad Shahzad [8] Khattak3 This paper evaluates four most typically used distribution methods, i.e., Generalized Extreme Value (GEV), Log Pearson 3 (LP3), Gumbel Max, and Normal that of the flood frequency and recurrence of flood estimation. Flood frequency analysis is that the foremost typical technique used for the at-site estimation of flood recurrence magnitude. In Pakistan, floods are among the foremost devastating and recurring natural hazards. Assessment of flood hazard requires flood event magnitude and probability of occurrence. Different stations data such as hydrological data namely Khwazakhela, Chakdarra, Panjkora, and Munda Headwork located at Swat river was taken from Provincial Irrigation Department, Khyber Pakhtunkhwa. The analysis is completed for 5-, 10-, 25-, 50-, and 100-year return periods by using annual maximum discharge data from 1980 to 2016 (37 year). Three goodness-of-fit tests were applied to the fitted distributions, i.e., Kolmogorov–Smirnov, Anderson–Darling, and Chi-squared at 5% significance level. Results indicate that LP3 and GEV were ranked top two distributions in within the slightest degree locations while Gumbel Max and Normal were the tiniest amount fitted having rank 3 and 4, respectively.

Nibedita Guru, Ramakar Jha [9] The analysis was carried out for flood series data of two gauging stations Kesinga (upstream) and Kantamal (downstream) of Tel basin, Mahanadi river system.Analysis was performed using both the Annual Maximum and Peak over Threshold (POT) flood series data. t has been observed that the values below 5% probability of exceedance are affecting the downstream regions and may create disaster in Mahanadi basin. Out of Fourteen frequency distributions, Generalized Pareto (GP) distribution showed the best results for AM data sets, whereas LN (3P) distribution showed best results for POT data sets followed by GP distribution.

Vikas Kamal, Priyadarshini Singh, Chandrashekhar Azad Vishwakarma [10] The Ganga River may be a major river of North India and is understood for its fertile alluvium deposits formed because of floods throughout the Indo-Gangetic plains. Flood frequency analysis has been administrated through various approaches for the Ganga River by many scientists. With changes in river bed brought out by anthropogenic changes the intensity of flood has also changed within the last decade, which entails further study. the current study is in a very a part of the Upper Indo-Ganga plains subzone 1(e). Distributions such as Statitical applied on the discharge data at two stations found that for Haridwar lognormal and for Garhmukteshwar Gumbel EV1 is applicable. The importance of this study lies in its ability to predict the discharge for a return period after an acceptable distribution is found for a part.

M. Sultan Bhat, Akhtar Alam, Bashir Ahmad, Bahadur. S. Kotlia, Hakim Farooq, Ajay K. Taloor , Shabir Ahmad [11] This study aims to carry out the flood frequency analysis of river Jhelum in Kashmir basin. Probability distributions area employed for simulating the future flood discharge scenarios using annual peak flow(1956-2014) from 3 gauging state of river Jhelum.The finding reveal that the estimated discharge of all return period exceeds the current average carrying capacity, so it is likely to flood in return period of 5 years.The present study demonstrates that the river discharge can be satisfactorily projected by any one of the used probability distribution methods; however, as revealed by the goodness-of-fit test, Log-Pearson Type III was found to be the better fitted probability distribution among the two.

Kalpalatha Ganamala, Sundara Kumar Pitta [12] Flood frequency analysis is that the most vital statistical technique in understanding the character and magnitude of high discharge during a river. the target of frequency analysis is to relate the magnitude of events to their frequency of occurrence through probability distribution. the size and shape parameters of the distribution were estimated using method of moments. The study which was carried in Vijayawada aimed toward Prediction of Flood frequency analysis of Krishna river of Prakasam barrage at Vijayawada using Gumbel's, California, Hazen's methods. Here all are estimated using different data's of flood from 1990-2014 of Prakasam Barrage which were collected from Water Resources Department of Vijayawada. The magnitude of the deluge involves be for 20 years and 50 years is1823.33TMC and 1873.34 TMC.

3. METHODOLOGY

The Section discuss on the metha The GEV, Normal, Gumbel Max and LP-III distributions are generally utilized in different hydrological studies to estimate extreme values of observed data series. Table 2 depicts the different parameters and parameters estimation methods used by GEV, Gumbel Max, LP-III and Normal distributions. Statistical distribution details are provided by McCuen and Hosking and Wallis. Easy Fit package helps in fitting the GEV, Gumbel Max, Normal, and LP-III distributions automatically to datasets with the help of parameter estimation techniques. Probability Distribution Function (PDF) and Cumulative Distribution Function (CDF) are characterized for Kidangoor gauging station of Meenachil River basin. The PDF for GEV, Normal, Gumbel Max and LP-III distribution are represented in Equations.

$$f(x) = \frac{1}{\sigma}\exp(-(1+kz)^{-\frac{1}{k}}(1+kz)^{-1-\frac{1}{k}})k \neq 0$$

$$f(x) = \frac{\exp\left(-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right)}{\sigma\sqrt{2\pi}} - \infty < x < +\infty$$

$$f(x) = \frac{1}{\sigma}\exp(-z - \exp(-z))k = 0$$

where $z = \frac{x-\mu}{\sigma}, -\infty < x < +\infty$

$$f(x) = \frac{1}{x|\beta|\Gamma(\alpha)}\left(\frac{\ln(x)-\gamma}{\beta}\right)^{\alpha-1}\exp\left(-\frac{\ln(x)\gamma}{\beta}\right)$$

where $\Gamma(\alpha)$ = complete gamma function.

3.1 Generalized Extreme Value (GEV)

Extreme value distributions are quite useful in civil engineering where the extreme conditions, which occur rarely, are the critical design elements. This is particularly true when considering the natural hazards such as the maximum intensity of the earthquake in the life span of a building, maximum flood levels in the life span of a bridge. These distributions are also useful in travel behaviour modelling where the decisions related to the mode choice are presumed to follow EV distribution. Gumbel, which is also identified as type 1 EV distribution, is one such distribution that deals with minute datasets. If magnitude of datasets is more than 50, GEV will perform well with superior results. Frequency factor for GEV Distribution:

$$K_t = \frac{\sqrt{6}}{\pi}\left\{0.5772 + \ln\left[\ln\left(\frac{T}{T-1}\right)\right]\right\}$$

K_t = frequency factor = $\frac{x-\mu}{\sigma}$.
To express T in terms of K_t

$$T = \frac{1}{1 - \exp\left\{-\exp\left[-\left(0.5772 + \frac{\pi K_t}{\sqrt{6}}\right)\right]\right\}}$$

T- return period.

For different return period, predicted discharge (Qp) is found out utilizing normal distribution formula which is given by

$$Q_p = \mu + K_t\sigma$$

where μ = standard mean, σ = standard deviation (SD)

3.2 Normal distribution

In theory of likelihood, statistical distribution may be a commonly used probability distribution. this is often significant in statistical field and is often utilized in natural and science for representing real valued arbitrary variable. Mean and SD are two constraints. mean (or simple mean) of a sample x1+ x2+…….+ xn usually signified as l is summation of sample values divided by number of item (n).

$$\text{Simple mean or average } (C) = \frac{x_1 + x_2 + \cdots x_n}{n} = \frac{1}{n}\sum_{i=1}^{n} xi$$

For specified T, probability factor ð Þ P is calculated in (%) using conversion formula given by

$$P = {}^{1}/_{T}(\%)$$

3.3 Gumbel Max

Gumbel distribution is possibly the most commonly used statistical distribution for hydrological modeling. From collected data, actual discharge ð Þ Q has been evaluated for monsoon season. Then formulae of l and r have been utilized to standardize calculated discharges for corresponding seasons. For specified T, reduced variate (Y_t) is evaluated using formula

$$Y_t = -\left[\ln \cdot \ln\left(\frac{T00}{(T-1)}\right)\right]$$

Abridged mean (Y_n) and abridged SD (S_n) has been determined for given sample size (N) from Gumbel distribution table. Then K_t is estimated by

$$K_t = {}^{(Y_t - Y_n)}/_{S_n}$$

Finally, Q_p is computed for different return periods for the respective seasons.

$$Q_p = \mu + K_t\sigma$$

3.4 Log Pearson III

LP-III distribution is a method used in statistics to fit frequency distribution data for predicting flood at gauge stations of a stream. From the collected data, we calculate the actual discharge (Q) for monsoon season. Then natural logarithm of Q is calculated and its logarithmic l and logarithmic r is found out for respective seasons using

$$Z = \log_{10} Q$$

Subsequently, coefficient of skewness (Cs) is determined utilizing logarithmic discharge ð Þ Z and for specified T, probability (P) is calculated using

$$P = {}^{1}/_{T}(\%)$$

3.5 Goodness-of-fit

Test Goodness of fit helps to explain how statistical model fits well to observed datasets. This method characteristically summarizes difference amid observed values and people expected under the considered model. This test is additionally utilized for testing if obtained data are fitting to a distribution from certain population (i.e., normal or Weibull distribution population). Three subsequent goodness-of-fit tests (KS, AD and CS tests) were used for various sample at significance level of 0.05.

Gauging station- Kidangoor ⇨ Peak flood discharge ⇨

expected discharge ⇦ Return period ⇦ Four methods

⇩ Goodness of fit test.

4. Theoretical Work

4.1 Data Collection

The daily discharge data observed at gauging station (76°41'2.40"E, 9°42'36"N) of Meenachil geographic region for a period of 34 years from 1985 to 2018 was collected from the Irrigation Design and Research Board (IDRB) Trivandrum, Department of Irrigation, Kerala. Also the discharge data of gauging station Kidangoor of Meenachil basin for these period was observed and compared together to search out out the values needed for our post project calculations. a number of the values of discharge has been collected from the location where gauging stations are established.

Maximum discharge of Kidangoor gauging station were collected from year 1985 to 2018 from Central Water Commission (CWC) coimbatore, India. The annual maximum discharge data were used for flood frequency analysis.

4.2 Data Analysis

Flow data are denoted in terms of exceedance probabilities and recurrence intervals. Considering, as the annual maximum flood in year i and the quantile (F) as the value of expected to exceed with probability F, the following relation, P (≥ (F)) = F, during the year of concern is derived. Thus, there is an F % chance for Q ≥ Q (F) occurrence. In other way, there is a (1−F) % chance that events X <Q (F) occurs. The return period T of a flood, is the reciprocal of the probability of exceedance in one year computed as 1/ (F).

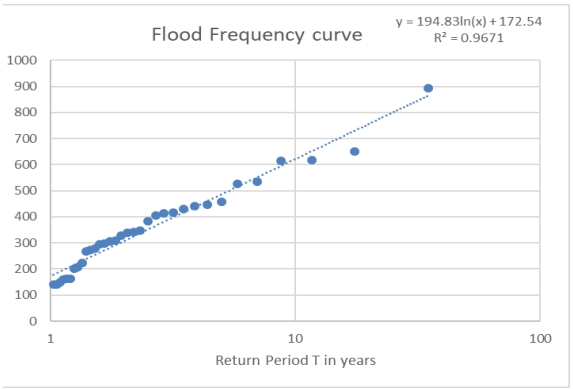
Here we use the Software called MATLAB to plot the graphs of collected data. MATLAB is a programming platform used by millions of engineers and scientists to analyse data, develop algorithms, and create models.

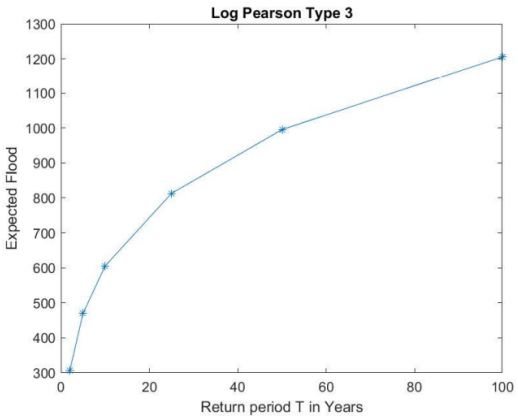
4.3 MATLAB Software

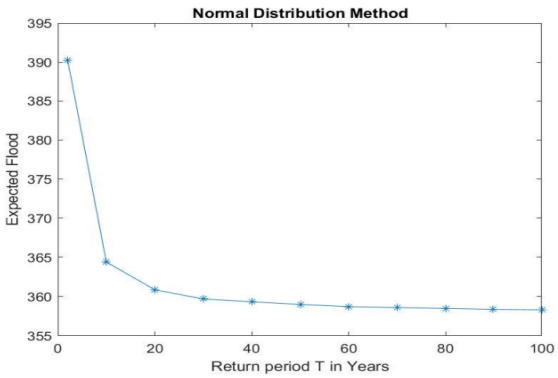
Based on data, return period and predicted discharge need to be calculated and plotting graph using MATLAB. So the procedure is given below;

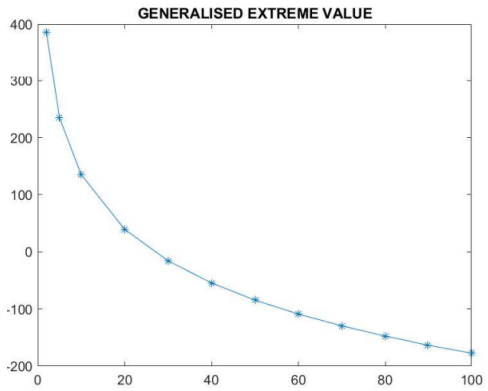
- Plot the graph of 4 methods of return period- predicted flood graph and return period- measured flow discharge graph.
- In MATLAB, after you import data into the MATLAB workspace, it is a good idea to plot the data so that you can explore its features. An exploratory plot of the data enables to identify discontinuities and potential outliers, as the regions of interest.
- Load and plot data from the text and record. Each data column in the file represents data for one intersection.

The Result will be getting the plotted Graph of the following data.









Four Graphs shows the 4 methods of Return period versus Expected flood

From the Gumbel's distribution, the expected estimated discharges for return periods of 2yrs, 10yrs, 50yrs and 100yrs were obtained as 331.41 m^3/s, 616.84 m^3/s, 867.08 m^3/s and 972.87 m^3/s respectively. These values can be adopted as a guide for storm water management in the region during flood. The predicted value and measured value of discharge showed good agreement without much variation as indicated in Fig. 4. Flood frequency analysis was carried out

for Pala watershed, which lies in the upstream side of Meenachil River basin. The analysis used peak discharge data of 34 years from 1985- 2018. From the plot of the reduced variate versus peak flood, the trend line equation gives R^2 value of 0.9778. This showed that the pattern of the scatter is narrow and therefore Gumbel's distribution method is suitable for predicting expected discharge in the river. The frequency analysis also showed good capability of the Gumbel distribution to predict river flood magnitudes occurring in different return period. There were no significant differences between the predicted and measured discharge values. Hence, the model can be reliably applied to predict the occurrence of floods in the catchment. This mathematical relation can also be considered for several extreme event distributions in the region where emergency evacuation of people could be done. This type of flood prediction can also be utilized in the designing of important hydraulic structures in the river reach.

5. CONCLUSION

FFA analyses incorporate assumptions at each stage of the modelling process. An important one is the assumption of a high degree of accuracy in the estimation of discharges.

This work is carried out in Kidangoor gauging stations of Meenachil River basin considering hydrological data. GEV, LP-III, Gumbel Max and Normal distribution methods are employed for predicting flood frequency and a relationship is established to find out peak discharge during monsoon period. In the present study, the Easyfit software is utilized for finding goodness of fit and the effectiveness of proposed probability distribution methods. It is observed that consideration of the frequency distribution with lower range of probability trigger warnings earlier to sensitive gauging stations.

The statistical approaches are fit to tune the magnitude of flood with frequency distribution. On basis of ranking, it is found that Gumbel max ranked as 1st, whereas LP III, GEV and normal distribution as 2nd, 3rd and 4th respectively. From the plot of the reduced variate versus peak flood, the trend line equation gives R^2 value of 0.9778. This showed that the pattern of the scatter is narrow and therefore Gumbel's distribution method is suitable for predicting expected discharge in the river. The frequency analysis also showed good capability of the Gumbel distribution to predict river flood magnitudes occurring in different return period. This prediction of flood can be utilised in the designing of important hydraulic structures and bridges in the river reach.Also in the case of extreme flood emergency evacuation of people can be carried out well in advance. Similar study can also be carried out on some other study region, as the method used for the study is having a constant formula, which remains spatially constant.

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