

**VERIFICATION OF THE OBSERVED DISCHARGE DATA  
BY USING TANK MODEL  
AND  
FLOOD FORECASTING BY GUMBEL'S METHOD  
IN KATHMANDU VALLEY OF BAGMATI BASIN AT KHOKANA**

**BY**

**SURAJ SHRESTHA**

**T.U. Regd. No: 5-2-37-783-2006**

**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE  
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## Approval

The thesis attached herewith entitled “Verification of the observed discharge data by using Tank Model and Flood Forecasting by Gumbel’s method in Kathmandu Valley of Bagmati basin at Khokana” prepared and submitted by Mr. Suraj Shrestha in partial fulfillment of the requirement for the Master’s Degree of Science in Meteorology to the Central Department of Hydrology and Meteorology, Tribhuvan University, is hereby accepted.

### Approved by:

.....  
Prof. Dr. Lochan Parsad Devkota  
(Internal Examiner and HOD)  
Central Department of Hydrology &  
Meteorology  
Tribhuvan University  
Kirtipur, Nepal

.....  
Dr. Sunil Adhikari (Associate professor)  
(External Examiner)  
Department of Hydrology &  
Meteorology  
Trichandra Multiple Collage  
Ghantaagar, Nepal

.....  
Mr. Tirtha Raj Adhikari (Lecturer)  
(Dissertation Supervisor)  
Central Department of Hydrology &  
Meteorology  
Tribhuvan University  
Kirtipur, Nepal

## Certificate

This is to certify that the thesis entitled “**Verification of the observed discharge data by using Tank Model and flood forecasting by Gumbel’s method in Kathmandu valley of Bagmati Basin at Khokana.**” submitted by Mr. Suraj Shrestha for the partial fulfillment of Master’s Degree of Science in Meteorology to the Central Department of Hydrology and Meteorology, Tribhuvan University during the academic year 2013, is based on his original research and investigations carried out under my guidance and supervision.

Sincerely,

.....

Mr. Tirtha Raj Adhikari (lecturer)

Dissertation Supervisor

Central Department of Hydrology and Meteorology

Tribhuvan University

## Certificate of Authorship

I certify that:

- ❖ I am responsible for the work submitted in this project report, and that the original work is my own except as specified below. (*specify*)
  
- ❖ I have not submitted this work to any other institution for the award of a degree.
  
- ❖ All information (including diagrams and tables) or other information which is copied from, or based on, the work of others has its source clearly acknowledged in the text at the place where it appears.

Signed:

Date:

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## ABSTRACT:

Flow estimation at a point in a river is vital for a number of hydrologic applications including flood forecasts. This paper presents the results of a basin scale rainfall-runoff and hydraulic modeling in Bagmati river basin in Nepal. A distributed lumped conceptual flood forecasting model, namely Tank Model was calibrated in this study for the Bagmati River Basin of Kathmandu valley at Khokana. Ten years rainfall, evaporation and discharge data were collected from DHM and compiled as an input to Tank Model. The simulation was done for a period of ten years data, eight years during calibration and two years during validation. Statistical method and objective functions were applied to evaluate the verification capability of the Tank Model. Eight years of flood data were used to calibrate the Tank Model and the performance of the model was verified by using 2007 and 2008 data. A set of tank coefficients that suit tank configuration selected for Bagmati River Basin were determined by trial and error calibrations. The predicted peak discharge was close to the observed value and the smaller discharges followed the observed trend. A mean of  $15\text{m}^3/\text{s}$ ,  $11\text{m}^3/\text{s}$  was calculated for the observed discharge while the mean of the simulated discharge was  $16\text{m}^3/\text{s}$ ,  $12\text{m}^3/\text{s}$ , during the validation period of 2007 and 2008 respectively. The standard deviation was  $25\text{m}^3/\text{s}$ ,  $13\text{m}^3/\text{s}$  for the observed discharge and  $17\text{m}^3/\text{s}$ ,  $10\text{m}^3/\text{s}$  for the simulated discharge during the validation period of 2007 and 2008 respectively. The overall correlation coefficient between observed and simulated discharge was 0.84, 0.90, 0.85, 0.91, 0.91, 0.91, 0.83, and 0.79 during calibration period. The maximum instantaneous flow of  $942\text{m}^3/\text{s}$  was recorded while the lowest flood flow of  $103\text{m}^3/\text{s}$  was recorded during observation. The 17-year mean instantaneous flood flow is  $420.76\text{m}^3/\text{s}$  with a skewness of 0.98 and Confidence Level (95%) of 126.31. The maximum instantaneous flow of  $820.41\text{m}^3/\text{s}$  was recorded while the lowest flood flow of  $59.25\text{m}^3/\text{s}$  was recorded during simulation. The 10-year mean instantaneous flood flow is  $221.26\text{m}^3/\text{s}$  with a skewness of 2.64 and Confidence Level (95%) of 158.08. Measured and predicted flood flows show no significant differences hence, a goodness of fit of the Gumbel distribution.

Key Words: Flood forecast, Tank Model, Gumbel Distribution, Calibration, Validation and Bagmati Basin

## Table of Contents

| <b>Contents</b>                          | <b>Pages</b> |
|--|--------------|
| ABSTRACT.....                            | iii          |
| Acknowledgement.....                     | iv           |
| Certificate of Authorship.....           | v            |
| List of Tables.....                      | vi           |
| List of Figures.....                     | vii          |
| Table of Contents.....                   | ix           |
| 1 Introduction.....                      | 1            |
| 1.2 Objectives of the study.....         | 3            |
| 1.3 Limitations of Study.....            | 3            |
| 1.4 Station selection for the study..... | 4            |
| 1.5 Thesis layout.....                   | 5            |
| 2 Literature Review.....                 | 6            |
| 2.1 Precipitation.....                   | 6            |
| 2.2 Peak Discharge.....                  | 7            |
| 2.3 Evaporation and transpiration.....   | 8            |
| 2.4 Infiltration.....                    | 8            |
| 2.5 Stream flow.....                     | 9            |
| 2.6 Flood estimation.....                | 10           |
| 2.7 Rainfall-Runoff models.....          | 11           |
| 2.8 Flood Frequency analysis.....        | 15           |
| 2.9 Summary.....                         | 15           |
| 3 Study area.....                        | 16           |
| 3.1 Topography.....                      | 17           |
| 3.2 Climate.....                         | 18           |

|       |  |    |
|-------|--|----|
| 3.3   | River System.....  | 23 |
| 3.4   | Source of Data.....  | 25 |
| 4     | Methodology.....   | 26 |
| 4.1   | Tank Model.....  | 26 |
| 4.1.1 | Data file (*.dat).....   | 26 |
| 4.1.2 | The parameter file (*.par).....                                      | 26 |
| 4.1.3 | Initial condition file (*.ini).....                                  | 26 |
| 4.1.4 | Simulation file (*.sim).....   | 26 |
| 4.1.5 | Model.....   | 27 |
| 4.1.6 | Input.....   | 29 |
| 4.2   | A short theoretical description of the application introduction...30 |    |
| 4.3   | Introduction to genetic algorithm.....                               | 31 |
| 4.4   | Tank Model with soil moisture storage.....                           | 33 |
| 4.5   | Model Calibration.....   | 39 |
| 4.6   | Model validation.....  | 39 |
| 4.7   | Gumbel's Method.....   | 41 |
| 5     | RESULTS AND DISCUSSION.....  | 44 |
| 5.1   | Result.....  | 44 |
| 5.1.1 | Model Calibration.....   | 44 |
| 5.1.2 | Model validation.....  | 47 |
| 5.1.3 | Flood Frequency analysis.....  | 68 |
| 5.2   | Discussion.....  | 71 |
| 6     | Conclusions and Recommendations.....                                 | 74 |
| 6.1   | Conclusions.....   | 74 |
| 6.2   | Recommendations.....   | 75 |
|       | REFERENCES .....   | 76 |



## List of Tables

| <b>Tables</b>  | <b>Page</b> |
|--|-------------|
| Table1.1: list of stations .....                                       | 4           |
| Table5.1. Tank model parameters used for calibration.....              | 45          |
| Table5.2. Initial condition for Tank model used for calibration.....   | 46          |
| Table5.3. Calibrated Tank model parameters.....                        | 46          |
| Table5.4. Validated Tank model parameters.....                         | 48          |
| Table5.5. Efficiency of the Tank Model on the basis of daily data..... | 67          |
| Table5.6. Flood estimation using the Gumbel distribution.....          | 69          |

## List of Figures

| <b>Figure</b>  | <b>page</b> |
|--|-------------|
| Fig.1: Satellite image of the Bagmati River Basin in the Kathmandu Valley.....                     | 16          |
| Fig.3.1: Study Area.....   | 17          |
| Fig.3.2: Annual average temperature at Godavari from 1999-2008.....                                | 19          |
| Fig.3.3: Annual average temperature at Khokana from 1999-2008.....                                 | 19          |
| Fig.3.4: Annual average temperature at Khumaltar from 1999-2008.....                               | 20          |
| Fig.3.5: Annual average temperature at Ktm Airport from 1999-2008.....                             | 20          |
| Fig.3.6: Annual average temperature at Nagarkot from 1999-2008.....                                | 21          |
| Fig.3.7: Annual average temperature at Panipokhari from 1999-2008.....                             | 21          |
| Fig.3.8.a: Discharge at Khokana from 1999-2008.....  | 22          |
| Fig.3.8.b: Annual Rainfall Runoff Relationship Bagmati at Khokana .....                            | 22          |
| Fig.3.9: River System of Bagmati Basin.....  | 24          |
| Fig.4.1: Structure of Tank Model.....  | 37          |
| Fig.4.2: General Flow Chart of Tank.....   | 38          |
| Fig.5.1: Daily observed flows and rainfall in the year 1999.....                                   | 49          |
| Fig.5.2: Daily simulated flows and rainfall in the year 1999.....                                  | 50          |
| Fig.5.3: Daily observed and simulated flows and rainfall in the year<br>1999 using tank model..... | 50          |
| Fig.5.4: Daily observed flows and rainfall in the year 2000.....                                   | 51          |
| Fig.5.5: Daily simulated flows and rainfall in the year 2000.....                                  | 51          |
| Fig.5.6: Daily observed and simulated flows and rainfall in the year<br>2000 using tank model..... | 52          |
| Fig.5.7: Daily observed flows and rainfall in the year 2001.....                                   | 52          |
| Fig.5.8: Daily simulated flows and rainfall in the year 2001.....                                  | 53          |
| Fig.5.9: Daily observed and simulated flows and rainfall in the year<br>2001 using tank model..... | 53          |
| Fig.5.10: Daily observed flows and rainfall in the year 2002.....                                  | 54          |
| Fig.5.11: Daily simulated flows and rainfall in the year 2002.....                                 | 54          |

|  |    |
|--|----|
| Fig.5.12: Daily observed and simulated flows and rainfall in the year<br>2002 using tank model.....                  | 55 |
| Fig.5.13: Daily observed flows and rainfall in the year 2003.....  | 55 |
| Fig.5.14: Daily simulated flows and rainfall in the year 2003.....   | 56 |
| Fig.5.15: Daily observed and simulated flows and rainfall in the year<br>2003 using tank model.....                  | 56 |
| Fig.5.16: Daily observed flows and rainfall in the year 2004.....  | 57 |
| Fig.5.17: Daily simulated flows and rainfall in the year 2004.....   | 57 |
| Fig.5.18: Daily observed and simulated flows and rainfall in the year<br>2004 using tank model.....                  | 58 |
| Fig.5.19: Daily observed flows and rainfall in the year 2005.....  | 58 |
| Fig.5.20: Daily simulated flows and rainfall in the year 2005.....   | 59 |
| Fig.5.21: Daily observed and simulated flows and rainfall in the year<br>2005 using tank model.....                  | 59 |
| Fig.5.22: Daily observed flows and rainfall in the year 2006.....  | 60 |
| Fig.5.23: Daily simulated flows and rainfall in the year 2006.....   | 60 |
| Fig.5.24: Daily observed and simulated flows and rainfall in the year<br>2006 using tank model.....                  | 61 |
| Fig.5.25: Daily observed flows and rainfall in the year 2007.....  | 61 |
| Fig.5.26: Daily simulated flows and rainfall in the year 2007.....   | 62 |
| Fig.5.27: Daily observed and simulated flows and rainfall in the year<br>2007 using tank model.....                  | 62 |
| Fig.5.28: Daily observed flows and rainfall in the year 2008.....  | 63 |
| Fig.5.29: Daily simulated flows and rainfall in the year 2008.....   | 63 |
| Fig.5.30: Daily observed and simulated flows and rainfall in the year<br>2008 using tank model.....                  | 64 |
| Fig.5.31: Comparison between Gumbel Distribution of annual daily<br>maximum discharge of observed and simulated..... | 70 |