# 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**

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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:**

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# 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,

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## 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 2007and 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$m^3$/s, 11$m^3$/s was calculated for the observed discharge while the mean of the simulated discharge was 16$m^3$/s, 12$m^3$/s, during the validation period of 2007 and 2008 respectively. The standard deviation was 25$m^3$/s, 13$m^3$/s for the observed discharge and 17$m^3$/s, 10$m^3$/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$m^3$/s was recorded while the lowest flood flow of 103 $m^3$/s was recorded during observation. The 17-year mean instantaneous flood flow is 420.76$m^3$/s with a skewness of 0.98 and Confidence Level (95%) of 126.31. The maximum instantaneous flow of 820.41 $m^3$/s was recorded while the lowest flood flow of 59.25$m^3$/s was recorded during simulation. The 10-year mean instantaneous flood flow is 221.26$m^3$/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

**Contents** **Pages**

# List of Tables

**Tables** **Page**

## List of Figures

**Figure** **page**