COMPARISON OF PERIODIC AUTOREGRESSIVE STOCHASTIC MODELS

AND

FLOOD FREQUENCY ANALYSIS

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ABSTRACT

The problem of floods and their computation is one of the main concern of hydrologists and engineers. Optimal development of water resources necessitates design and construction of hydraulic structures such as dams, barrages, levees, diversion structures etc. Besides these, the design of rail and road bridges across water courses also depends to a great extent on the estimation of maximum flood flow expected during their economic life period. For the economic design of a structure which passes flood water, the rational estimation of design flood is very essential, so that the design is safe.

The flood frequency analysis is the commonly used approach for estimation of design flood, particularly for small and medium structures. When data record of sufficient length is available then flood frequency analysis can be based on the record alone. However, when data available is limited then data should be generated by any stream flow generation model. The maximum flood series can then be abstracted to use for flood frequency analysis.

Various stream flow generation models are available in literature but in this research four periodic Autoregressive (AR) models are used to generate the discharge data of Indus river and

its Punjab tributries at Kotri, Sukkar, Kalabagh, Punjnad, Rasul, Khanki and Sidhnai barrages. These models are compared on the basis of overall and seasonal 10-daily statistics and Rosener and Yevjvich Univariate (RYU) model (1966) is judged to be the best model.

10-daily discharge data, at each site, is generated by YJU model for 100 years and maximum annual peak flows are abstracted. Gumbel's extreme value type-i and Pearson type-iii distributions were assumed to use for flood frequency analysis. Histograms of annual series are fitted with expected frequencies of these distributions. Kolmogorv-Smirnov and Chi-Square goodness of fit tests are applied to select one of these distributions. It is found that Gumbel's Extreme value type-i distribution is fits well to the annual series. Corrected maximum liklihood method is used to estimate the parameters of the distribution. Flood estimates for 2, 5, 10, 20, 50, 100, 200, and 500 years of return periods are calculated by Gumbel's Extreme value type-i distribution.