A DYNAMIC MODEL FOR RUNOFF ESTIMATION BASED ON TRANSFER FUNCTION

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ABSTRACT

A hydrologic system model is an approximation of the actual system, which facilitates the causal linkage between the inputs and outputs within the watershed. The development and application of watershed models describing transformation of precipitation to runoff have been prime focus of scientific research and investigation throughout the evolution in the field of hydrology. The use of hydrological model for prediction purposes arises largely because of inadequacy of the hydrologic data (Dooge, 1972). The selection of a particular hydrological model depends on the requirements of the user, the problem, the approach and the economics. It is understood that a given model will rarely satisfy all of these requirements, and consequently one model will seldom be uniformly better than the other under all circumstances (Singh and Woolhiser, 1976). Hydrologists admit that watershed response is inherently spatial, non-linear and time-variant; nevertheless, linear time-invariant conceptual models have been found effective and satisfactory tools for runoff computations. In hydrological context, the basin is regarded as the system in which an input of effective rainfall is transformed into an output of discharge at the basin outlet. Hydrologic data are generally available in sampled or discrete form; however from practical view point, the discrete-time models are more appropriate in modeling hydrologic processes. With this in view, the discrete linear input-output model is used to simulate the transformation of excess rainfall into runoff. The concept of the runoff response functions, viz; impulse response and unit step functions provide an important tool of system identification. These

functions could be regarded as the performance indices of a watershed system to give a precise mathematical description of linear system and evaluate the operational performance of the watershed rainfall-runoff system. In the present study, two-parameter variable storage coefficient model was developed and applied for the hydrologic investigations in Karkara watershed, a sub-watershed of the Tilaiya dam catchment of Upper Damodar Valley having an area of 27.93 sq. km. for prediction of direct runoff hydrographs on storm basis. The qualitative and quantitative performance of the model was tested using some of the commonly used statistical indices. The model was found to be working well for the study area based on performance evaluation criteria.