

Study of Initial Value and Boundary Value Problems Using Laplace Transform Method and Differential Transform Method

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Abstract: *Initial Value Problems (IVPs) and Boundary Value Problems (BVPs) are fundamental in modeling numerous physical science & scientific processes described by differential equations. This investigates application of Laplace Transform Method (LTM) & Differential Transform Method (DTM) for solving such problems and compares their effectiveness in terms of accuracy, convergence and computational efficiency. The mathematical formulations of both methods are presented & applied to representative linear and nonlinear differential equations. The solutions obtained are analyzed to evaluate their simplicity, reliability and practical applicability. The Laplace Transform Method is found to provide exact analytical solutions for many linear initial value problems while Differential Transform Method offers an efficient recursive approach that generates rapidly convergent series solutions with reduced computational effort. The comparative findings demonstrate that both methods are effective analytical techniques and their suitability depends on the nature of problem governing equations and specified initial or boundary conditions.*

Keywords: Initial Value Problems, Boundary Value Problems, Laplace Transform Method, Differential Transform Method & Differential Equations