ABSTRACT

Chapter 1 contains introduction of reaction-diffusion equations and basic idea about the method of lines. Chapters 2 and 3 consist of few numerical methods to solve the one-dimensional reaction-diffusion equation with homogeneous and non-homogeneous time dependent boundary conditions. These methods are third-order accurate and L-stable in space and time and don't require complex arithmetic. In these methods, the matrix exponential function is approximated by a rational approximation and quadrature term is approximated by quadrature formula. These chapters also treat the applications of these methods. Parallel algorithms are developed for their implementation and it is found that the methods are third-order accurate. Chapter 4 provides summary, conclusion and application of the methods.