Abstract

A reaction-Diffusion Systems is a special type of system of Partial Differential Equations in which *diffusion* parts and *reaction* parts appear. Reaction-diffusion systems are arising in modelling of *reaction* and *diffusion* processes of real world problems in areas of chemistry, ecology, biology, physics etc.

This thesis discusses some reaction-diffusion systems in numerical and analytical view points. It is impossible or very difficult to find analytical solutions of reaction-diffusion equations in many occasions. In such cases numerical techniques help us to find approximate solutions. In this thesis *Finite Difference* methods are used in simulation of reaction-diffusion systems. Semigroup theory and some functional analysis techniques are used to discuss some reaction-diffusion systems in analytical view point.

This thesis focuses on some mathematical models arising in areas chemical kinetics, population dynamics and medicine. There is an interesting property of some reaction-diffusion models in chemical kinetics. That is solutions of such models form spatial patterns. It is called reaction-diffusion pattern formation. Here some patterns formed by pattern formation reaction-diffusion systems are presented.