



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student : MRITYUNJOY BARMAN

Roll Number : 176123001

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Thesis Title: Analysis of Parameter-Uniform Numerical Methods for Singularly Perturbed Differential Equations with Two Parameters

Name of Thesis Supervisor(s) : Prof Srinivasan Natesan

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SHORT ABSTRACT

The thesis studies the construction and analysis of some simple, yet very efficient numerical methods that produce parameter-uniform approximate solutions to singularly perturbed differential equations (SPDEs) with two parameters. In most cases, due to the presence of the parameters and the prescribed boundary conditions, the solutions to these problems give rise to some interesting phenomena called "boundary layers". These problems having this kind of solution characteristics require some special adaptive strategies to obtain sufficiently accurate numerical approximations. The methods discussed in the thesis solves some two-parameter SPDEs of elliptic and parabolic type in some rectangular domain. The convergence of the proposed methods is independent of perturbation parameters, and the accuracy in the approximate solutions is significantly better than the classical finite difference methods. The thesis also provides satisfactory validation of the convergence phenomena using a good number of numerical examples for each of the problems.