1083-34-19 **John Bryce McLeod** and **Susmita Sadhu*** (susmita.sadhu@gmail.com). *An integral equation method to derive uniform asymptotic expansions of solutions of a class of singularly perturbed boundary value problems.*

We will consider a class of singularly perturbed boundary value problems (BVPs):

$$\varepsilon y'' + 2y' + f(y) = 0, \quad y(0) = 0,\ y(A) = 0,$$

where $f \in C^2[0, \infty)$ is a positive function satisfying certain conditions. It can be shown that the BVP admits at most two solutions depending on A. The main goal of this talk is to rigorously prove a uniform asymptotic expansion of the "smaller" solution using an integral equation method, whenever the problem admits two solutions.

To achieve our goal, we will prove an existence result that will ensure a uniform bound on the "smaller" solution and that would lead us to the asymptotics. Indeed, we will prove that for each $A_0 < 2\int_0^\infty dy/f(y)$, there exist $\varepsilon(A_0) > 0$ and positive constants K and C that depend only on A_0 and not on ε, such that if $\varepsilon \in (0, \varepsilon(A_0))$ and $A \in (0, A_0]$ then the problem has a unique solution y satisfying $\|y\| \leq K$ and $|\varepsilon y'(0)| \leq C$. The proof leads easily to the desired asymptotic expansion. (Received July 03, 2012)