ON SOME NONLOCAL ELLIPTIC SYSTEMS WITH MULTIPLE PARAMETERS

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Abstract

Using variational methods, we study the existence of positive solution for a class of Nonlocal eliptic systems with multiple parameters. The proofs rely essentially on sub and supersoloutions method.

Keywords: Nonlocal ellliptic systems, positive solutions, sub and supersolutions method, Variational methods

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1 Introduction

In this paper we study the existence of positive solutions to the following nonlocal elliptic systems

$$\begin{cases} -M_1\left(\int_\Omega |\nabla u|^p\,dx\right) div\left(h_1(|\nabla u|^p)\,|\nabla u|^{p-2}\,\nabla u\right) = \alpha_1 a(x) f_1(v) + \beta_1 b(x) g_1(u) \quad x\in\Omega, \\ -M_2\left(\int_\Omega |\nabla v|^q\,dx\right) div\left(h_2(|\nabla v|^q)\,|\nabla v|^{q-2}\,\nabla v\right) = \alpha_2 c(x) f_2(u) + \beta_2 d(x) g_2(v) \quad x\in\Omega, \\ u=v=0. \quad x\in\partial\Omega, \end{cases} \tag{1}$$

where Ω is a bounded domain in $\mathbb{R}^N$ with smooth boundary $\partial\Omega$, $1<p,q<N$,
$M_i:\mathbb{R}_0^+\to\mathbb{R}$. $i=1,2$, are continuous and nondecreasing functions,where $\mathbb{R}_0^+=[0,+\infty)$, $a,b,c,d\in C(\overline{\Omega})$, and $\alpha_i,\beta_i,i=1,2$, are positive parameters
We assume throughout this paper the following hypotheses

(H1) $a,b,c,d\in C(\overline{\Omega})$ and $a(x)\geq a_0>0$, $b(x)\geq b_0>0$, $c(x)\geq c_0>0$, $d(x)\geq d_0>0$ for all $x\in\Omega$.,

(H2) $M_i:\mathbb{R}_0^+\to\mathbb{R}^+$, $i=1,2$, are two continnous and increasing functions and $0<m_i\leq M_i(t)\leq m_{i,\infty}$ for all $t\in\mathbb{R}_0^+$.m

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