

ON DOUBLY NONLOCAL p -FRACTIONAL COUPLED ELLIPTIC SYSTEM

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ABSTRACT. We study the following nonlinear system with perturbations involving p -fractional Laplacian:

$$(P) \quad \begin{cases} (-\Delta)_p^s u + a_1(x)u|u|^{p-2} = \alpha(|x|^{-\mu} * |u|^q)|u|^{q-2}u \\ \quad + \beta(|x|^{-\mu} * |v|^q)|u|^{q-2}u + f_1(x) & \text{in } \mathbb{R}^n, \\ (-\Delta)_p^s v + a_2(x)v|v|^{p-2} = \gamma(|x|^{-\mu} * |v|^q)|v|^{q-2}v \\ \quad + \beta(|x|^{-\mu} * |u|^q)|v|^{q-2}v + f_2(x) & \text{in } \mathbb{R}^n, \end{cases}$$

where $n > sp$, $0 < s < 1$, $p \geq 2$, $\mu \in (0, n)$, $p(2 - \mu/n)/2 < q < p_s^*(2 - \mu/n)/2$, $\alpha, \beta, \gamma > 0$, $0 < a_i \in C(\mathbb{R}^n, \mathbb{R})$, $i = 1, 2$ and $f_1, f_2: \mathbb{R}^n \rightarrow \mathbb{R}$ are perturbations. We show existence of at least two nontrivial solutions for (P) using Nehari manifold and minimax methods.

1. Introduction and main results

In this article, we consider the following nonlinear system with perturbations involving p -fractional Laplacian:

$$(P) \quad \begin{cases} (-\Delta)_p^s u + a_1(x)u|u|^{p-2} = \alpha(|x|^{-\mu} * |u|^q)|u|^{q-2}u \\ \quad + \beta(|x|^{-\mu} * |v|^q)|u|^{q-2}u + f_1(x) & \text{in } \mathbb{R}^n, \\ (-\Delta)_p^s v + a_2(x)v|v|^{p-2} = \gamma(|x|^{-\mu} * |v|^q)|v|^{q-2}v \\ \quad + \beta(|x|^{-\mu} * |u|^q)|v|^{q-2}v + f_2(x) & \text{in } \mathbb{R}^n, \end{cases}$$

2010 *Mathematics Subject Classification.* 35R11, 35R09, 35A15.

Key words and phrases. p -fractional Laplacian; Choquard equation; Nehari manifold.