

ON A SEMILINEAR FOURTH ORDER ELLIPTIC PROBLEM WITH ASYMMETRIC NONLINEARITY

FABIANA M. FERREIRA — EVERALDO S. MEDEIROS — WALLISOM ROSA

ABSTRACT. In this work, we address the existence of solutions for a bi-harmonic elliptic equation with homogeneous Navier boundary condition. The problem is asymmetric and has linear behavior on $-\infty$ and superlinear on $+\infty$. To obtain the results we apply topological methods.

1. Introduction and main results

In this paper, we investigate the existence of solutions for the following bi-harmonic elliptic equation with Navier boundary condition:

$$(1.1) \quad \begin{cases} \Delta^2 u = \lambda_1^2 u + u_+^p + f(x) & \text{in } \Omega, \\ u = \Delta u = 0 & \text{on } \partial\Omega, \end{cases}$$

where $\Omega \subset \mathbb{R}^N$ ($N > 5$) is a smooth bounded domain, λ_1 is the first eigenvalue of the Laplacian operator $-\Delta$ with the Dirichlet boundary condition, $u_+ = \max\{u, 0\}$ and $p > 1$. We assume that the function f satisfies the hypotheses

(H₁) $f \in L^r(\Omega)$ for some $r > N/2$;

2020 *Mathematics Subject Classification.* 31B30, 35J25, 35J40, 35J61, 35B45, 35A16.

Key words and phrases. fourth order operator; a priori estimates; spectral theory; topological degree.

The second author was supported by CNPq/Brasil and by Grant 2019/2014 Paraíba State Research Foundation (FAPESQ).