ON A SEMILINEAR FOURTH ORDER ELLIPTIC PROBLEM WITH ASYMMETRIC NONLINEARITY

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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:

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

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

(H_1) $f \in L^r(\Omega)$ for some $r > N/2$;