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Jaffar Ali, Ken Brown and Ratnasingham Shivaji* (shivaji@ra.msstate.edu), Department of Mathematics/CCS, Mississippi State University, Mississippi State, MS 39762. *Positive solutions to $n \times n$ elliptic systems with combined nonlinear effects.*

We study the existence and multiplicity of positive solutions to $n \times n$ systems of the form

$$\begin{aligned} -\Delta u_1 &= \lambda f_1(u_2) && \text{in } \Omega \\ -\Delta u_2 &= \lambda f_2(u_3) && \text{in } \Omega \\ &\vdots = \vdots && \\ -\Delta u_{n-1} &= \lambda f_{n-1}(u_n) && \text{in } \Omega \\ -\Delta u_n &= \lambda f_n(u_1) && \text{in } \Omega \\ u_1 &= u_2 = \cdots = u_n = 0 && \text{on } \partial\Omega. \end{aligned}$$

Here Δ is the Laplacian operator, λ is a non-negative parameter and Ω is a bounded domain in \mathbb{R}^N with smooth boundary $\partial\Omega$. The nonlinearities $f_i \in C^1([0, \infty))$, $i \in \{1, 2, \dots, n\}$ are strictly increasing functions such that $f_i(0) \geq 0$, $i \in \{1, \dots, l-1, l+1, \dots, n\}$ and $f_l(0) > 0$ for some $l \in \{1, \dots, n\}$ (positone systems), and satisfy a combined sublinear condition at ∞ . We establish our results by the method of sub and supersolutions.

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