Existence of globally positive and bounded solutions for second order equations with changing sign weight

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The existence of solutions globally positive in $[0,\infty)$, starting from a given positive value and bounded on $\mathbb{R}^+$ is studied for the class of second order differential equations

$$(a(t)\Phi(x'))' + f(t,x) = \lambda b(t)F(x) \qquad t \geq 0,$$

where $\Phi(u) = |u|^\alpha \text{sgn } u$, $0 < \alpha \leq 1$, λ is a positive parameter and f, b and F are continuous functions in their domain. We assume that $b \equiv 0$ in $[0,1]$ and it can change its sign for $t \geq 1$. For this reason, the above equation can be seen a perturbation for $t \geq 1$ of the equation $(a(t)\Phi(x'))' + f(t,x) = 0$.

By means of a new approach which combines, in a suitable way, two separated problems on $[0,1]$ and $[1,\infty)$ and uses some continuity arguments, the existence of globally positive and bounded solutions is proved for every λ sufficiently small.

This is a joint work with Z. Došlá and M. Marini.

References

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