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Two point boundary value problems for the Sturm-Liouville equation with highly discontinuous nonlinearities. (English) Zbl 1237.34026

The existence of three solutions for the boundary value problem

\[
\begin{align*}
-(\overline{p}u')' + r u' &= \lambda g(u) \text{ in } (a, b), \\
u(a) &= u(b) = 0
\end{align*}
\]

is established, where \(\overline{p}, r, \overline{q} \in L^\infty[a, b]\) and \(g: \mathbb{R} \to \mathbb{R}\) is an almost everywhere continuous function. Here, the set of the points of discontinuity of \(g\) may be uncountable but, solutions are actually generalized solutions. The approach is the critical point theory for non-differentiable functions.

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MSC:
34B15 Nonlinear boundary value problems for ordinary differential equations
34A36 Discontinuous ordinary differential equations
34B24 Sturm-Liouville theory
58E50 Applications of variational problems in infinite-dimensional spaces to the sciences
58E05 Abstract critical point theory (Morse theory, Lyusternik-Shnirel’man theory, etc.) in infinite-dimensional spaces

Keywords:
critical points; variational methods; discontinuous nonlinearities; Sturm-Liouville problem; multiple solutions

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