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A note on a third-order multi-point boundary value problem at resonance. (English)

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Summary: Based on the coincidence degree theory of Mawhin, we prove some existence results for the following third-order multi-point boundary value problem at resonance

$$x'''(t) = f(t, x(t), x'(t), x''(t)), \quad t \in (0,1),$$

$$x''(0) = \sum_{i=1}^{m} \alpha_i x''(\xi_i), \quad x'(0) = 0, \ x(1) = \sum_{j=1}^{n} \beta_j x(\eta_j),$$

where $f : [0,1] \times \mathbb{R}^3 \to \mathbb{R}$ is a continuous function, $0 < \xi_1 < \cdots < \xi_m < 1$, $\alpha_i \in \mathbb{R}$, $i = 1, \ldots, m$, $m \geq 1$ and $0 < \eta_1 < \eta_2 < \cdots < \eta_n < 1$, $\beta_j \in \mathbb{R}$, $j = 1, 2, \ldots, n$, $n \geq 2$. In this paper, the dimension of the linear space $\operatorname{Ker} L$ (the linear operator L is defined by $Lx = x'''$) is equal to 2. Since all the existence results for third-order differential equations obtained in previous papers are for the case $\dim \operatorname{Ker} L = 1$, our work is new.

MSC:

34B10	Nonlocal and multipoint boundary value problems for ordinary differential equations
34B15	Nonlinear boundary value problems for ordinary differential equations
47N20	Applications of operator theory to differential and integral equations

Cited in **4** Documents

Keywords:

third-order differential equations; coincidence degree theory; multi-point boundary value problem; resonance

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