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# Existence of Positive Periodic Solutions for a Second-Order Nonlinear Neutral Differential Equation by the Krasnoselskii's Fixed Point Theorem

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**Abstract:** This work is devoted to the study of the existence of positive periodic solutions of the second order nonlinear neutral differential equation

$$\frac{d^2}{dt^2}x(t)+p(t)\frac{d}{dt}x(t)+q(t)x(t)=\frac{d^2}{dt^2}Q(t,x(t-\tau(t)))+f(t,h\left(x(t)\right),g\left(x(t-\tau(t))\right)).$$

The method used here is one of the most efficient techniques for studying this type of equations since it combines some useful properties of Green's function together with Krasnoselskii's fixed point theorem.

**Keywords:** *positive periodic solutions; nonlinear neutral differential equations; fixed point theorem.*

**Mathematics Subject Classification (2010):** 34K13, 34A34, 34K30, 34L30.

## 1 Introduction

In this work we are essentially interested in the study of the existence of positive periodic solutions for certain classes of second order nonlinear neutral differential equations which are ubiquitous in different scientific disciplines and arise specially in beam theory, viscoelastic and inelastic flows and electric circuits.

There is a sizeable literature related to this topic, for instance in the middle of the previous century, the existence of solutions of differential equations was extensively studied by many investigators, see, for example, the papers and books [1]- [9], [11], [12]. During

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