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BIFURCATIONS OBSERVED IN BVP OSCILLATOR WITH PERIODICALLY SWITCHED *RC* CIRCUIT

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Abstract. Many works have been devoted to the study of the behavior of the Bonhoeffer-van der Pol (BVP) oscillator in physiological and biochemical modeling studies. In this paper, bifurcations and chaos in BVP oscillator, which is intermittently connected to a parallel *RC* load, are investigated. By using the periodicity of switching action we introduce a composite discrete map as the Poincaré map that is useful for the analysis of piecewise nonlinear systems. Adjusting the switching period close to the integral multiple of the period of self-oscillation, we find various synchronizations. In particular, the fundamental synchronization is discussed. Under the appropriate switching ratios, we illustrate that the synchronized state bifurcates to chaotic states by the period doubling cascades or the torus breaking down.

Keywords. nonlinear circuit, periodic switch, composite Poincaré map, chaos, bifurcation.

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Notation

G_k^m: Saddle-node bifurcation of period-m orbit

P_k^m: Period-doubling bifurcation of period-m orbit

N_k^m: Neimark-Sacker bifurcation of period-m orbit
where k is the index.