NUMERICAL SEQUENCES AS A MATHEMATICAL MODEL OF DYNAMIC STATES IN ELECTRICAL RLC CIRCUITS

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The authors are interested in describing dynamic states of electrical circuits. The investigations are develop at science society Theory of Electrical Circuits.

The paper deals with three methods of finding the solutions in transient states.

The first method is based on differential equations. As a result, time functions discribing current in a linear electric circuit, are presented. To find the solution of this electric circuit, linear differential homogeneous and non-homogeneous equations, which depends on the source of power existence in circuit, were used.

The second operator method is based on the Laplace transform. The solution of the model is a transfer function $G(s)$, which describes relationship between input and output of the circuit in a complex domain.

The third method, which is the main subject of investigations, also describes an electrical circuit as a finite numerical sequences $[Q_0, Q_1, ..., Q_{2n-1}]$ with strictly defined properties. The numerical values $Q_0, Q_1, ..., Q_{2n-1}$ are derived from the time function $q(t)$ in initial conditions, where $q(t)$ is a function of electrical charge. Values of this sequences are independent on time and strongly connected with circuit topology. In previous methods differentiation and integration calculations are used. Sometimes it is impossible to solve this calculations in analytic w

ay so numerical methods, which are not accurate, are used. In presented model all this operations are replaced by adding, subtraction and multiplication matrix calculations. The algorithm can be translate into any programming language or into simple microchips.

Finally, the fact that finite numerical sequences are used, calculations bring the results without any loss of information.

References

[1] Piwowarczyk Tadeusz: *Wspolczynniki rozwiniecia potegowego oryginalu jako funkcje wspolczynnikow transformaty*, Czasopismo techniczne, PK Krakow 1996.