

ABSTRACT

The state-space model of an electrical machine having n no. of windings is represented by n no. of first order differential equations. Some of these equations are inherently nonlinear. These equations alongwith the torque/power equation are used to study the dynamical behaviors of the machines. However, as some equations are inherently nonlinear different techniques are adopted to solve these equations, e.g., speed is assumed to be constant or a known function of time, Doherty's Constant flux-linkage Theorem is applied, nonlinear terms in the state equations are ignored etc. Using these techniques, equations are actually linearized and solved. Therefore, the nonlinear phenomenon which occurs in a practical machine, is completely or partially omitted in the conventional studies and the dynamical behaviors of the machines are not being properly explained or still remain unexplained which causes a lot of inconvenience in understanding and problem-solving of the electrical machines. Furthermore, now electrical machines find some of it's sophisticated application like in space craft, remote sensing etc. So, the detailed study of the dynamical behaviors of the electrical machines which include bifurcation, chaos etc., have to be done to cater the need of the modern age.

In this work, an attempt will be made to study the dynamical behaviors of the electrical machines. In stead of classical approach of studying the machines individually, here generalized approach will be adopted to study the dynamical behaviors so that the same can be exploited for individual conventional machines. State-space model of a Generalized Machine will be developed and State equations will be normalized and using these equations dynamical behaviors of the machine will be rigorously studied. In this work, entire parameter space of the machine may be explored and the route of chaos through bifurcation may be identified. This idea about the parameters may be used in designing the electrical machines and thus desired dynamical behavior will be obtained from those machines.