

Abstract

Yasser Gaber A. Dessouky

Series universal ac generator: theory, operation and analysis

The series DC machine operates as a series DC motor as a series universal AC motor when fed from a DC an AC supply respectively. Series DC motors have been used in many industrial applications which require a high starting torque and a considerably adjustable range of speeds. Series universal AC motors are used in fractional horsepower ratings in many domestic appliances. The series DC machine also generates DC voltage when driven by a prime mover and connected to a DC load where the machine has rising voltage characteristics such that with increase in load its voltage is also increased and therefore it is normally used as a booster. In this paper, the series DC generator is operated as a series universal AC generator through an excitation capacitor. The armature winding, field winding, excitation capacitor and the load are connected in series. The voltage building up process takes place due to residual magnetism and the machine is self-excited and at steady state operates in the saturation region. The machine runs at resonance meaning that the generated induced emf is in phase with the armature current. The frequency of this machine is not synchronized with speed. The theory of operation is explained and the transient and steady state analysis are predicted and experimentally investigated.