Computation of Limit Cycle Via Higher Order Harmonic Balance Approximation and Its Application to A 3-Bus Power System

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Abstract This paper reviews and elaborates a frequency domain approximate method of estimating amplitude, frequency and stability of the limit cycle near Hopf bifurcations. A new iterative method and new criterion of ascertaining stability are presented. The method and criterion are applied to a 3-bus dynamic power system model to give the amplitude, frequency and stability at its Hopf bifurcations. New analytic formulas for bifurcation curves are derived by using analytic method, some new saddle-node bifurcation at low voltage levels are found on the formulas. The influence of rotor inertia on the Hopf bifurcation is also studied.

Index Terms-Higher order harmonic balance, amplitude and frequency of limit cycle, stability, saddle-node bifurcation, Hopf bifurcation.