GENROU

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Parameters (17)

Nominal frequency (assume )

Inertia constant

Damping coefficient

Winding resistance

, , Time constants

, , , , , Machine reactance parameters

, , Saturation parameters (Note: parameters are given as and , but and are used in the equations below. These are calculated such that and , and such that . This is one of three possible saturation models.)

Calculated constants from parameters (11)

Variables (20)

*Differential (state) variables (6):*

Machine internal angle

Machine relative speed deviation (0 is synchronous, -1 is 0 Hz)

,, , Machine internal flux values along d and q axes

*Algebraic internal variables (11):*

, , Machine total subtransient flux: q-axis, d-axis, total magnitude

Saturation coefficient

, Machine internal voltage

Electrical torque

, Terminal currents on the machine d-q reference frame

, Terminal currents on the network reference frame.

*Variables that can be either algebraic constants or controlled as external states (2):*

Mechanical power from the prime mover (the governor if present sets this value)

Field winding voltage from the excitation system (the exciter if present sets this value)

*Terminal voltage variables (2):*

, Terminal voltages on the network reference frame

Differential equations (6)

Algebraic equations defining internal variables (9)

Network interface equations (2)

Or equivalently

Or equivalently again

Where the rightmost terms are often condensed to a current source depending only on the state variables. and

Note: for the variables to be interfaced with other currents in the network, these equations must be scaled for different per-unit current bases. For machine calculations (i.e. getting above), solve the equations with , as given. For network calculations, use the same equations with and