**Euler’s method**

Where

A 60 Hz generator is supplying 200 MW and 0 Mvar to an infinite bus (with 1.0 per-unit) through two parallel transmission lines. Each transmission line has a per-unit impedance (with 100 MVA base) of j0.04. The per-unit transient reactance for the machine is j0.03, and its inertia constant is 10 seconds. A fault occurs at time = 0 halfway down one of the lines.

1. Rewrite the equations above with the only remaining variables: , , , , and .
2. Draw a circuit diagram of the system (a) before the fault and (b) during the fault. Use this to calculate the Thevenin equivalent impedance for each condition.
3. The pre-fault condition is in steady-state. Calculate the internal voltage, which will be equal to . What are the constant values of and , and the initial values of the variables and ?
4. Use Euler’s method with a time step of seconds, find the value of and at and .

Homework

More practice for Euler’s method: calculate the first three time steps of each initial value problem.

1.

2.

3.

Use the swing equation above:

A 60 Hz generator is supplying 150 MW and 0 Mvar to an infinite bus (with 1.0 per-unit) through two parallel transmission lines. The per-unit transient reactance for the machine is j0.01, and its inertia constant is 4 seconds. Each transmission line has a per-unit impedance (with 100 MVA base) of j0.06. A fault occurs at time = 0 one-third of the way down one of the lines, closer to the generator than the infinite bus.