



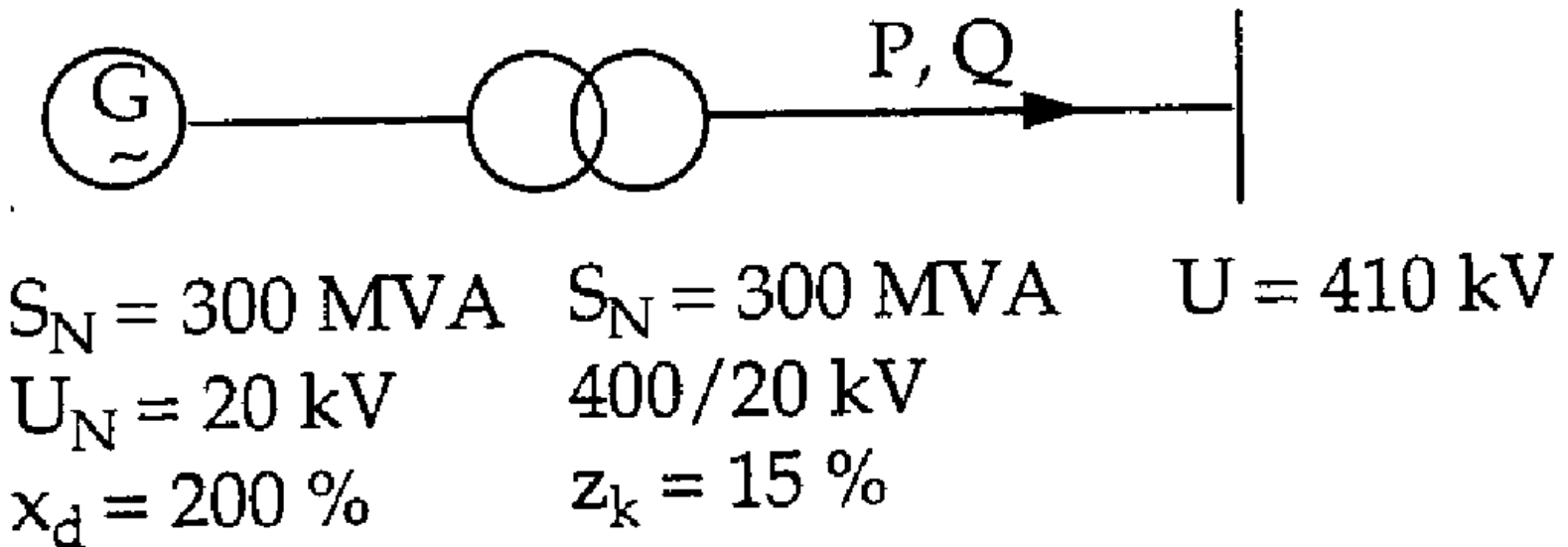
Aalto-yliopisto
Teknillinen korkeakoulu

Exercise 8

Power systems

Question 1

The generator is feeding the network. $P=250$ MW and $Q=0$ Mvar. Calculate the generator terminal voltage when it is disconnected from the network.



Question 2

A highly capacitive circuit of capacitance per phase $100\ \mu\text{F}$ is disconnected by a circuit breaker, the source inductance being $1\ \text{mH}$. The breaker gap breaks down when the voltage across it reaches twice the system peak line-to-neutral voltage of $38\ \text{kV}$. **Calculate the current flowing with the breakdown and its frequency and compare it with the normal (50-Hz) charging current of the circuit.**

Question 3

The effective inductance and capacitance of a faulted system as viewed by the contacts of a circuit breaker are 2 mH and 500 pF, respectively. The circuit breaker chops the fault current when it has an instantaneous value of 100 A. **Calculate the restriking voltage set up across the circuit breaker.** Neglect resistance.

Question 4

A long overhead line has a surge impedance of 500Ω and an effective resistance at the frequency of the surge of $7\Omega/\text{km}$. If a surge of magnitude 500kV enters the line at a certain point, calculate the magnitude of this surge after it has traversed 100km and calculate the resistive power loss of the wave over this distance. The wave velocity is $3 \times 10^5 \text{km/s}$.